APPENDIX J

HYDROLOGY AND WATER QUALITY REPORT

(Technical Appendices to this report are on file at the City of San José Department of Planning, Building and Code Enforcement, 200 East Santa Clara Street, San José CA, 3rd Floor)

City of San Jose
Coyote Valley Specific Plan
Draft EIR

October 2006

Coyote Valley Urban Reserve

Appendix I: Hydrology

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COYOTE VALLEY SPECIFIC PLAN DEIR
APPENDIX I: HYDROLOGY

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CHAPTER 1
EXISTING HYDROLOGIC CONDITIONS IN COYOTE VALLEY

This chapter provides a regional hydrologic context to Coyote Valley and the Coyote Creek watershed, discusses environmental and geologic settings, and describes existing water resources within the study area. This chapter also presents the interrelationship of surface water to groundwater within Coyote Valley, and introduces the concept of a basin in balance.

1.1 Environmental Setting

1.1.1 *Regional Setting*

Coyote Valley is part of the Santa Clara Valley that lies between the eastern flank of the Santa Cruz Mountains and the west side of the Diablo Range in Santa Clara County. Both of these ranges are part of the Coast Ranges which parallel the Pacific Coastline. Santa Clara Valley is clearly visible on a Landsat 7 image of the San Francisco Bay and Sacramento/San Joaquin Delta areas, included as Figure 1-1 to provide a regional context to Coyote Valley's location. Coyote Valley lies roughly 17 miles southeast of downtown San Jose at the south end of San Francisco Bay.

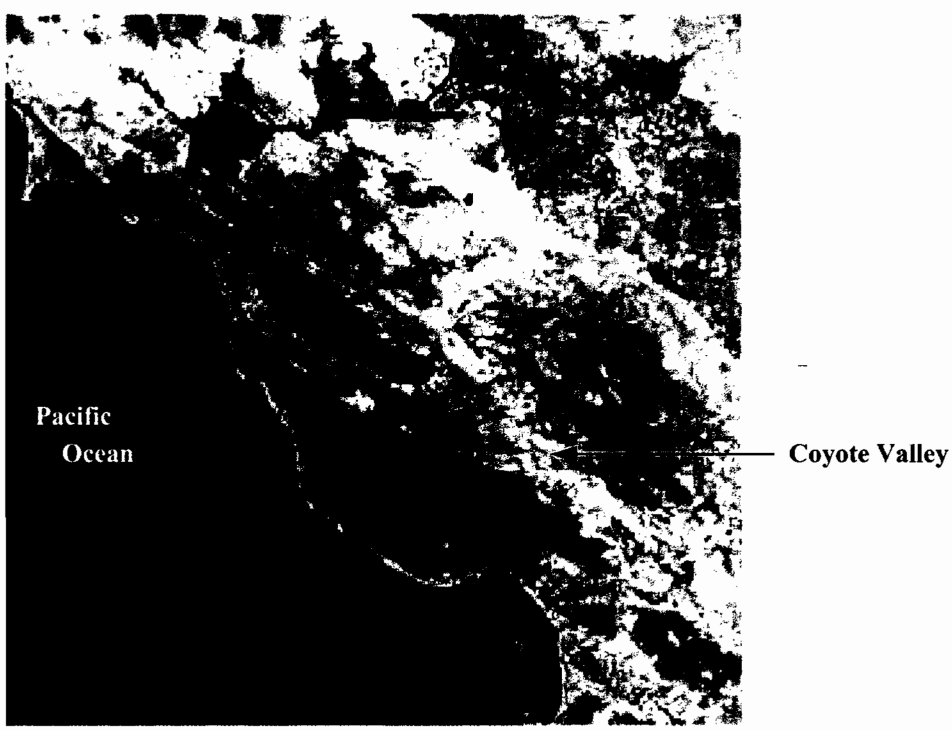
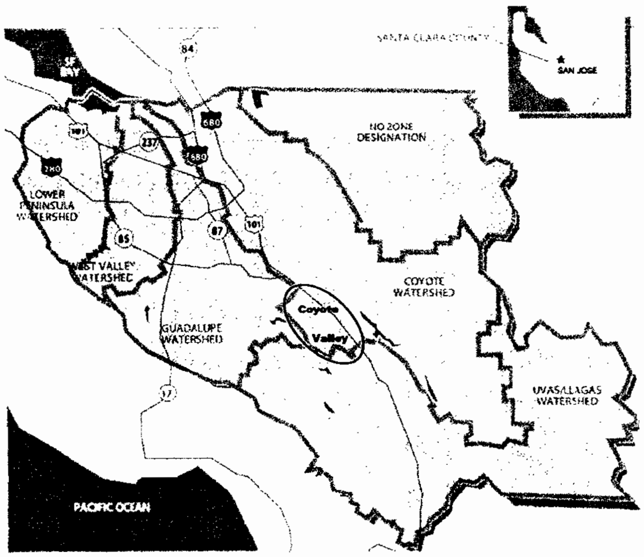


Figure 1-1: Landsat 7 Image of San Francisco Bay Area



1.1.2 *Watershed*

Coyote Valley is part of Coyote Creek's watershed, which is the largest watershed within Santa Clara County. Over 320 square miles of land area drains to San Francisco Bay via Coyote Creek and its tributaries, which are located within unincorporated areas of the county, the City of San Jose, and the City of Milpitas. The watershed's regional context is illustrated by Figure 1-2.

Figure 1-2: Coyote Watershed (SCVWD, 2005)

1.1.3 *Coyote Valley*

Figure 1-3 shows the topographic features that characterize Santa Clara County. Coyote Valley is located at the center of the county, and is the smallest of three valleys between the Diablo Range to the east, Santa Cruz Mountains to the west, San Francisco Bay to the north, and the Pajaro River to the south.

Figure 1-3: Santa Clara County Topography (From SCVWD, 2000)

Figure 1-4 shows an oblique view of Coyote Valley itself, projected from above Tulare Hill, looking south toward Morgan Hill with the Coyote Narrows in the left foreground. The defining feature of the Coyote Valley watershed viewed in the left foreground on Figure 1-4 is the Coyote Creek Narrows, which is a geologic feature located where the Diablo Range and Santa Cruz Mountains converge to restrict the flow of water to the north toward San Francisco Bay. At the narrows, Coyote Creek and its eastern tributaries drain about 205 square miles of upland area beginning at the Diablo Range ridge that forms the border with Stanislaus County. Most of Coyote Creek's watershed to the Narrows is located in rugged, sparsely populated areas.

Two water supply reservoirs owned and operated by the Santa Clara Valley Water District (SCVWD) – Anderson Reservoir and Coyote Reservoir – provide some regulation of storm water runoff. Southwest of Monterey Highway and the Southern Pacific Railroad (now Union Pacific Railroad), Fisher Creek drains 16 square miles of undeveloped uplands and agricultural valley floor to the narrows. Most of the Coyote Valley Specific Plan area lies within the Fisher Creek drainage.

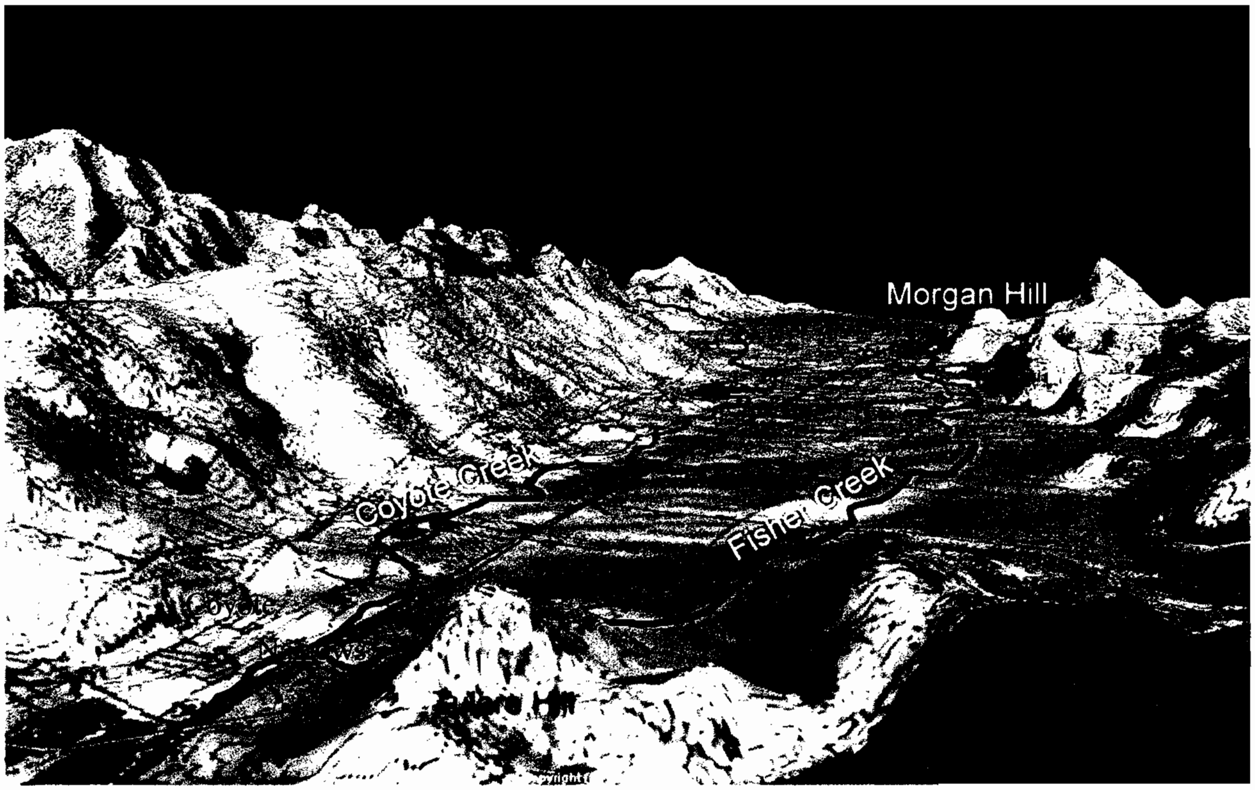


Figure 1-4: Oblique View of Coyote Valley from Tulare Hill Looking South

1.1.3.1 ***Geology.*** The study area sits atop broad alluvial fans that were formed as streams emerged from the eastern Diablo Range onto the Santa Clara Valley floor and deposited unconsolidated materials as their slopes flattened. Streambed deposits and alluvial fans generally slope toward San Francisco Bay to the northwest. The slight ridge at Cochrane Road divides waters (both surface and ground) that flow to the north from those that flow to the south through Morgan Hill and Gilroy to the Pajaro River and Monterey Bay. Geologists believe that an ancient Coyote Creek once drained to the Pajaro near the mouth of present-day Carnadero Creek. Because of this, a series of southward-trending deposits underlies the northward-trending alluvial deposits in Coyote Valley. (DWR, 1981)

1.1.3.2 ***Climate.*** The study area's climate is moderate – some would say ideal – with an average summertime high temperature of 82°F and an average winter low temperature of 38° F at Morgan Hill. Mean annual precipitation in the Coyote Creek watershed to the Narrows is about 24 inches, with 21 inches on the valley floor. Annual evapotranspiration over the watershed is approximately 49 inches, thereby resulting in an annual moisture deficit.[1]

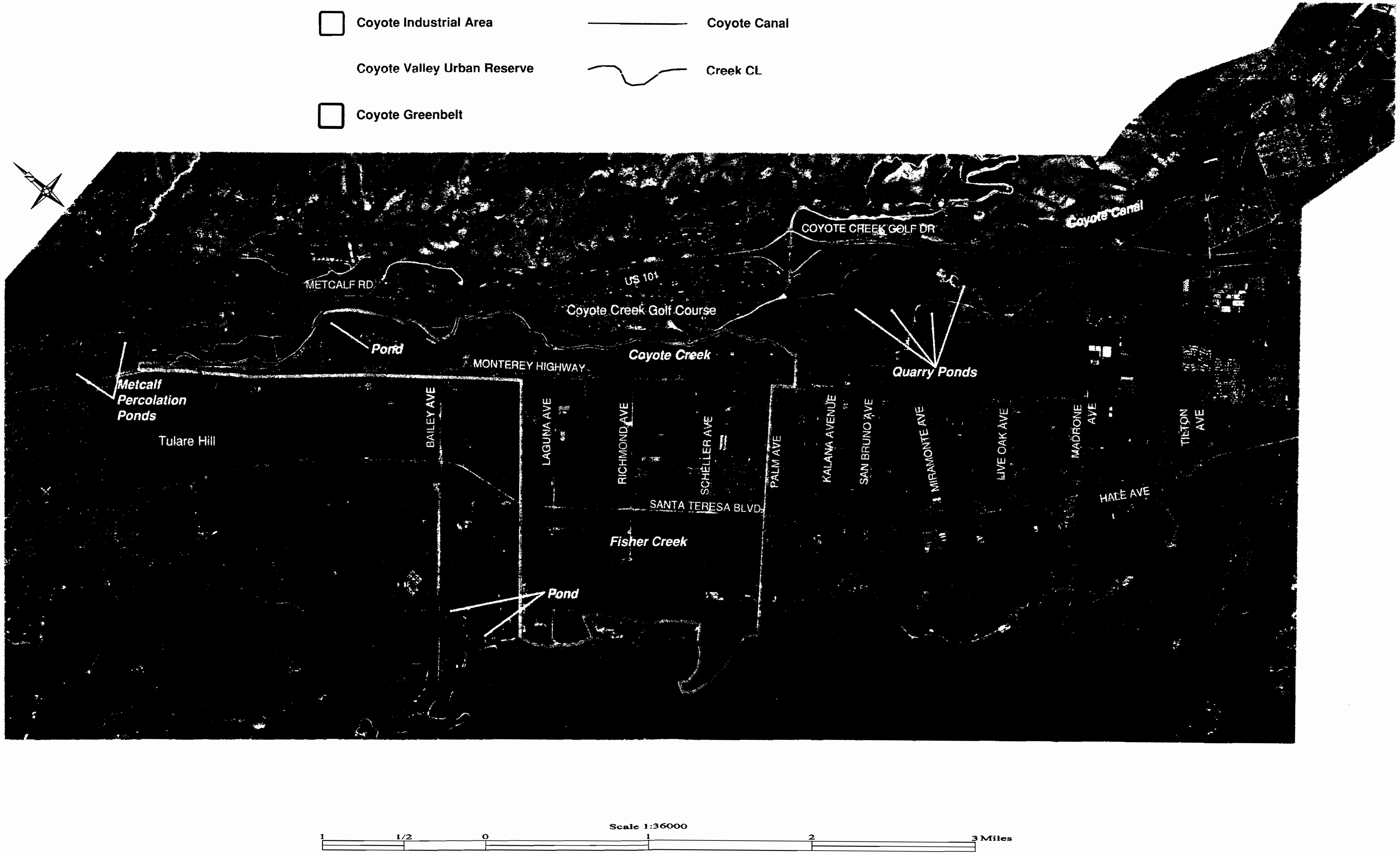
Roughly 90 percent of the region's annual precipitation falls from November through March. Year-to-year rainfall varies greatly, and droughts of various durations are common. Over the period of record of 129 years for San Jose rainfall, Santa Clara County has had seven major droughts, and several relatively wet periods. The driest and wettest two-year cases over the period of record have been 1976-1977 and 1982-1983 respectively. Precipitation has generally been above average in the County since the 1990's.

Rainfall is the predominant form of precipitation in the watershed, although the higher elevations of the Diablo Range occasionally receive measurable snowfall as shown in the photograph to the right. (A February 2001 storm dropped between 24 inches and 30 inches of snow at the Mount Hamilton Observatory; although the average annual snowfall is only 17 inches.) Snowmelt, however, is not considered to be a hydrologic process that significantly affects runoff within the watershed.

1.1.3.3 ***Land Use.*** As previously discussed, the majority of the watershed is located within rugged, sparsely populated hillside terrain covered with annual grasses and oak trees. Agricultural land uses dominate the Coyote Valley floor, with irrigated acreage alternating with fallow land. Some scattered residential, commercial and industrial uses and a golf course – Coyote Creek Golf Club – are located within the specific plan area. Figure 1-5 provides an aerial view of existing land uses within Coyote Valley.

1.1.3.4 ***Water Resources.*** Hydrology is the study of the occurrence, distribution, and movement of water on, in, and above the earth surface. Previously described environmental settings affect the availability and distribution of water resources that are shown within the study area on Figure 1-5.

[1] Source: California Irrigation Management Information System (DWR) data.



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CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

SURFACE WATER RESOURCES
In Coyote Valley

1-5

Coyote Creek, with headwaters in the Diablo Range southeast of Gilroy, flows for about 75 miles to San Francisco Bay through the cities of Morgan Hill, San José, and Milpitas. The principal tributaries of Coyote Creek within the Santa Clara Valley are Lower Penitencia Creek, Upper Penitencia Creek, Silver Creek, and Fisher Creek. Coyote Creek and its tributaries drain most of eastern Santa Clara County (Figure 1-2). Most of Coyote Creek's watershed is located in rugged, sparsely populated areas to the east of the Santa Clara Valley.

The SCVWD manages Coyote and Anderson Reservoirs, with a combined storage capacity of 115,000 acre-feet, to help regulate non-flood flows in Coyote Creek. Stored water is released to achieve desired flows in the creek for downstream water supply and environmental enhancement. Coyote Creek enters the Coyote Valley from the southeast at Anderson Reservoir. The creek crosses US 101 and meanders northward past Coyote Creek Golf Course to the Coyote Narrows. Several percolation ponds operated by SCVWD are located along Coyote Creek to recharge the groundwater sub-basin in San José. Abandoned quarry ponds, which are also used for groundwater recharge, are located along the creek in the southeastern portion of the CVSP area. Toward the northwest end of the valley, discontinuous basin deposits of clay tend to keep ponds, including the Metcalf Percolation Ponds, and other low areas filled with perched groundwater, above the main saturated aquifer.

The Coyote Canal is located to the east of Coyote Creek and parallels Highway 101. This facility was built to help manage water resources in the valley, and in particular to deliver water around Coyote Creek's recharge area between Highway 101 and the Coyote Creek Golf Course because this recharge historically caused high groundwater levels in Coyote Valley. The Coyote Canal has historically been a tool to manage groundwater in Coyote Valley and prevent the loss of water supplies upstream of the Metcalf Percolation Ponds and the aquifer it recharges.

Several manmade ponds dot the study area, particularly near Coyote Creek where abandoned river gravel quarries remain filled with groundwater all year. Toward the northwest end of the valley, discontinuous basin deposits of clay tend to keep ponds and other low areas filled with perched groundwater, above the main saturated aquifer.

1.2 Surface Water Hydrology

Surface water hydrology is a term used to describe the study of liquid water where it occurs above the ground surface. Groundwater hydrology generally refers to water storage and distribution below the ground surface. Surface water often begins as groundwater (and vice versa), so the two fields of study are completely inter-related, and this is especially the case in Coyote Valley. For convenience however, each type of hydrology is considered as a quasi-separate topic herein, beginning above ground. Figure 1-6 shows a delineation of the Coyote and Fisher Creek Watersheds to the Coyote Narrows from a surface water perspective.

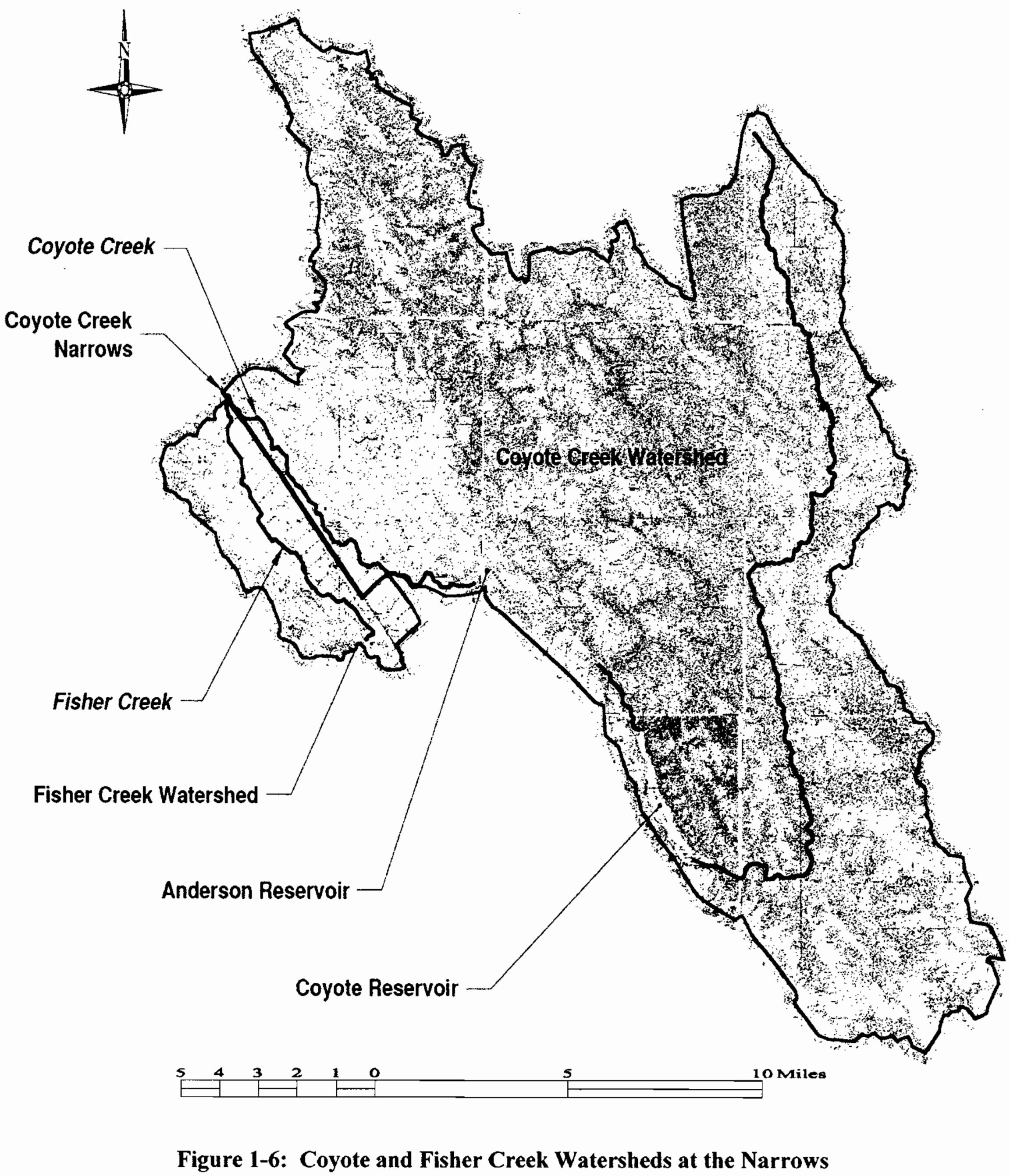


Figure 1-6: Coyote and Fisher Creek Watersheds at the Narrows

1.2.1 *Drainage Patterns*

Water within Coyote Valley naturally flows from Cochrane Avenue in the southeast toward the Coyote Narrows in the northwest. Land also tends to fall away from Coyote Creek to the west toward Fisher Creek, which generally flows through the lowest elevations of the valley toward its confluence with Coyote Creek at the Narrows. The Southern Pacific Railroad (now owned by Union Pacific) and a concrete median barrier along Monterey Highway force flood waters from the western bank of Coyote Creek to flow north rather than continue naturally toward Fisher Creek to the west.

Some low lying areas tucked into the northwestern hills near Santa Teresa Boulevard north of Bailey Avenue have been subject to winter inundation, particularly during wetter years when the groundwater table is high. Water sits atop the clay deposits and cannot easily flow back to Fisher Creek and out of the valley. This area is historically known as Laguna Seca ("small dry lake") and was once the wetland terminus for Fisher Creek's precursor as shown in Figure 1-7 (1917, prior to widespread agriculture) and Figure 1-8 (1939, after valley floor cultivation).

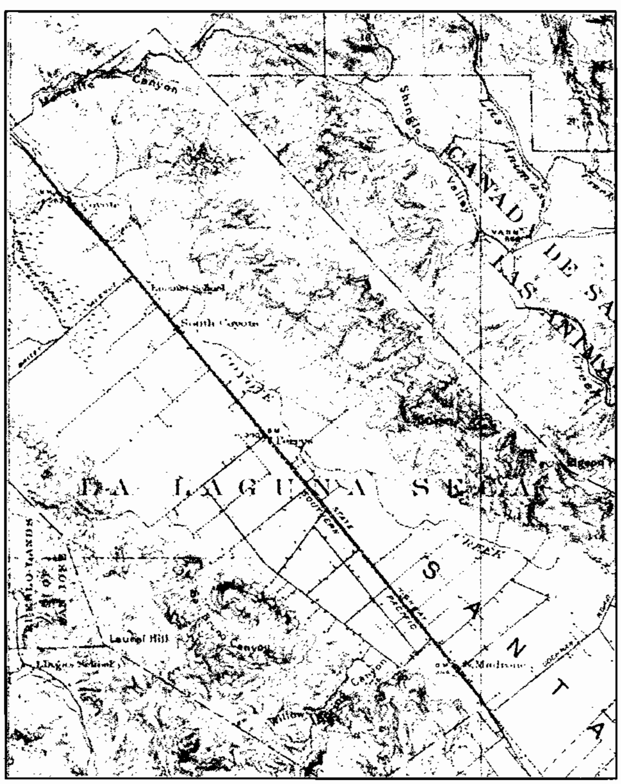


Figure 1-7: Laguna Seca (USGS, 1917)

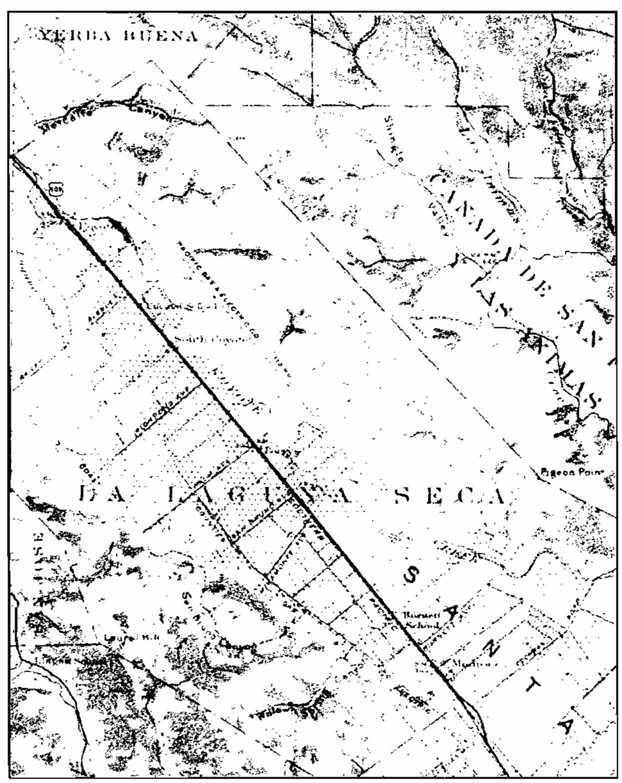


Figure 1-8: Laguna Seca (USACE, 1939)

1.2.1.1 ***Coyote Creek.*** As it flows through the plan area, Coyote Creek is an incised natural channel that is somewhat perched above its westerly floodplain (Figure 1-9). Sands and gravels predominate along its bed, and several man-made quarries have somewhat altered its natural flow regimes (Figures 1-10 and 1-11). Historically, Coyote Creek has meandered throughout its valley. In its present form, the creek is able to contain the majority of its discharge, even under estimated 100-year (one percent) flooding conditions.

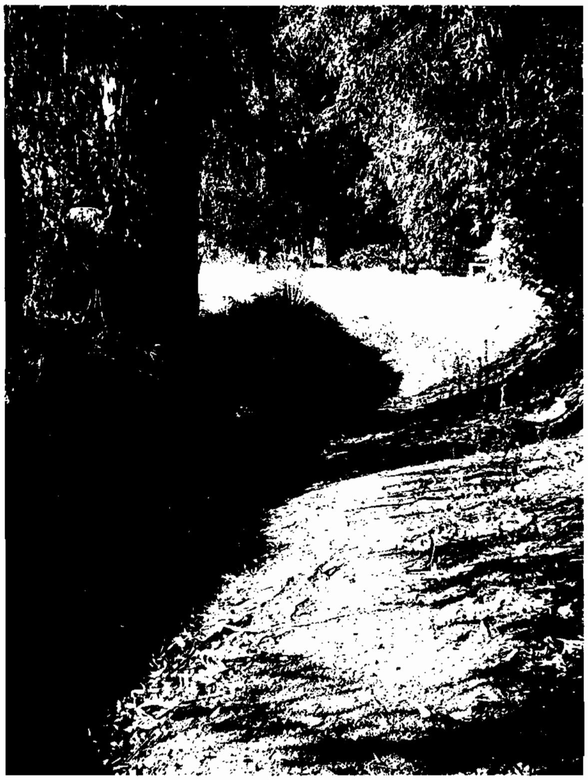
Figure 1-9: Coyote Creek at Golf Course

By comparing creek cross sections taken under existing conditions to those taken in the late 1970s, it appears that the creek has shifted a bit in places and may have even enlarged itself during the flood events in intervening years. The SCVWD does not list this reach of Coyote Creek as one prone to streambed degradation or aggradation.

Figure 1-10: Coyote Creek Steel Dam

Figure 1-11: Coyote Creek at Metcalf Ponds

1.2.1.2 ***Fisher Creek.*** The Fisher Creek channel is a manmade earthen channel within the development area, improved by a reclamation project in about 1963, and generally privately owned and maintained for agricultural drainage. The channel reach from Monterey Highway upstream to Bailey Avenue was constructed as a reclamation ditch to drain the low-lying areas in Laguna Seca.



Fisher Creek begins as a roadside drainage ditch between Tilton and Madrone Avenues in southern Coyote Valley. Running generally northwest, Fisher creek follows a natural meandering path, crossing under Santa Teresa Boulevard three times before reaching Palm Avenue. Water runs overland from the hills west of Palm Ave, and is collected and transported in roadside ditches or gutters. The most upstream discernable limit of Fisher Creek is between Madrone and Tilton Avenues, where Fisher Creek is a generally trapezoidal channel supporting a narrow riparian corridor (Figure 1-12). This reach of the Creek is ephemeral in nature, that is, the creek generally dries up in summer.

Figure 1-12: Fisher Creek Downstream of Madrone Ave.

Moving downstream, the Creek becomes more obviously man-made, both in its geometry (excavated) and its lack of any riparian corridor (Figure 1-13).

Downstream of Palm Avenue, Fisher Creek becomes a man made ditch, maintained primarily for agricultural purposes. The realignment of Fisher Creek between Palm Avenue and Bailey Avenue was completed by a reclamation project in about 1963, and since that time has served as an agricultural drainage ditch, with little to no natural habitat, and few identifiable natural features. Between Bailey Avenue and Monterey Highway Fisher Creek was constructed to drain the low-lying area known as Laguna Seca.

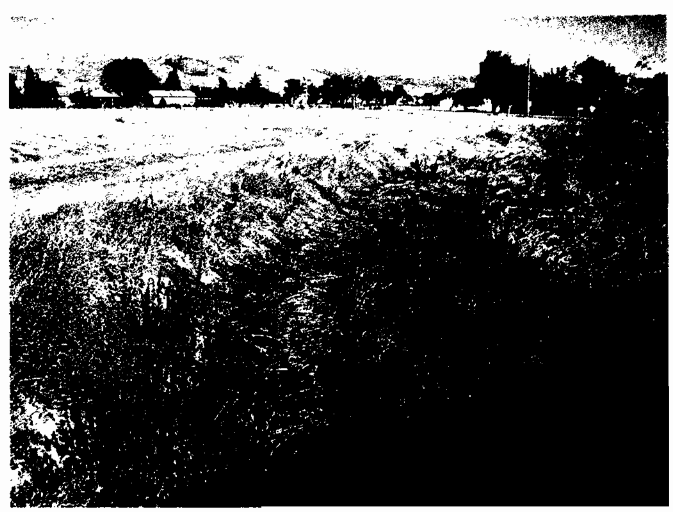


Figure 1-13: Fisher Creek in Greenbelt

Through this reach the Creek often flows during the summer months, through a combination of irrigation run off and a high groundwater table. The riparian habitat through this reach is varied. The year-round flow in the channel creates some reaches which are practically overgrown with small bushes and cattails, while other (dry) reaches appear barer, similar to Figure 1-13.

After crossing Santa Teresa Blvd downstream of Bailey Avenue, Fisher Creek returns to its more natural state, supporting not only a riparian corridor along the Creek, but also the seasonal wetland habitat of Laguna de Seca. The existing Fisher Creek channel is generally shallow and includes low levees through the Development Area, because most of the channel upstream of Santa Teresa Boulevard is located east of the lowest areas of the valley. Smaller drainage ditches west of the Fisher Creek channel collect agricultural and hillside runoff and discharge to Fisher Creek, which also drains the area east to the Union Pacific Railroad (UPRR). North of Bailey Avenue the channel has capacity for approximately the 10-year flood; south of Bailey Avenue existing channel capacity is for the 5-year flood, or less.

Historically, Fisher Creek was a multi-pronged drainage of the hill forming the western barrier of the Santa Clara Valley. The prongs were made up, for the most part, of small tributaries from the hill canyons. Past Bailey Avenue, Fisher Creek historically sustained the Laguna Seca wetland, which then outlets into Coyote Creek.

1.2.1.3 ***Laguna Seca.*** As discussed above, low lying areas north of Bailey Avenue are subject to periodic inundation during wetter years. Clay deposits relatively close to the ground surface create a perched groundwater table and prevent deep percolation of surface runoff. The Laguna Seca area adjacent to the southwest quadrant of Tulare Hill is particularly susceptible to ponding (Figure 1-14).

Summer

Winter

Figure 1-14: Laguna Seca in North Coyote Valley

1.2.2 *Riparian Corridors*

Both Coyote Creek and Fisher Creek have riparian corridors and the creeks help sustain habitats of vegetation and wildlife living immediately adjacent to them. (Riparian habitats generally refer to a creek environment.)

Fisher creek is ephemeral roughly south of Palm Avenue; that is, the creek generally dries up in summer. Along this reach, the creek consists of an excavated earthen channel and does not support substantial riparian vegetation. Further downstream water remains in the creek through the dry season, fed by perched groundwater in the lower elevations of the valley. A photograph near Laguna Seca showing riparian vegetation with an oak savanna background typical of the watershed is provided as Figure 1-15.

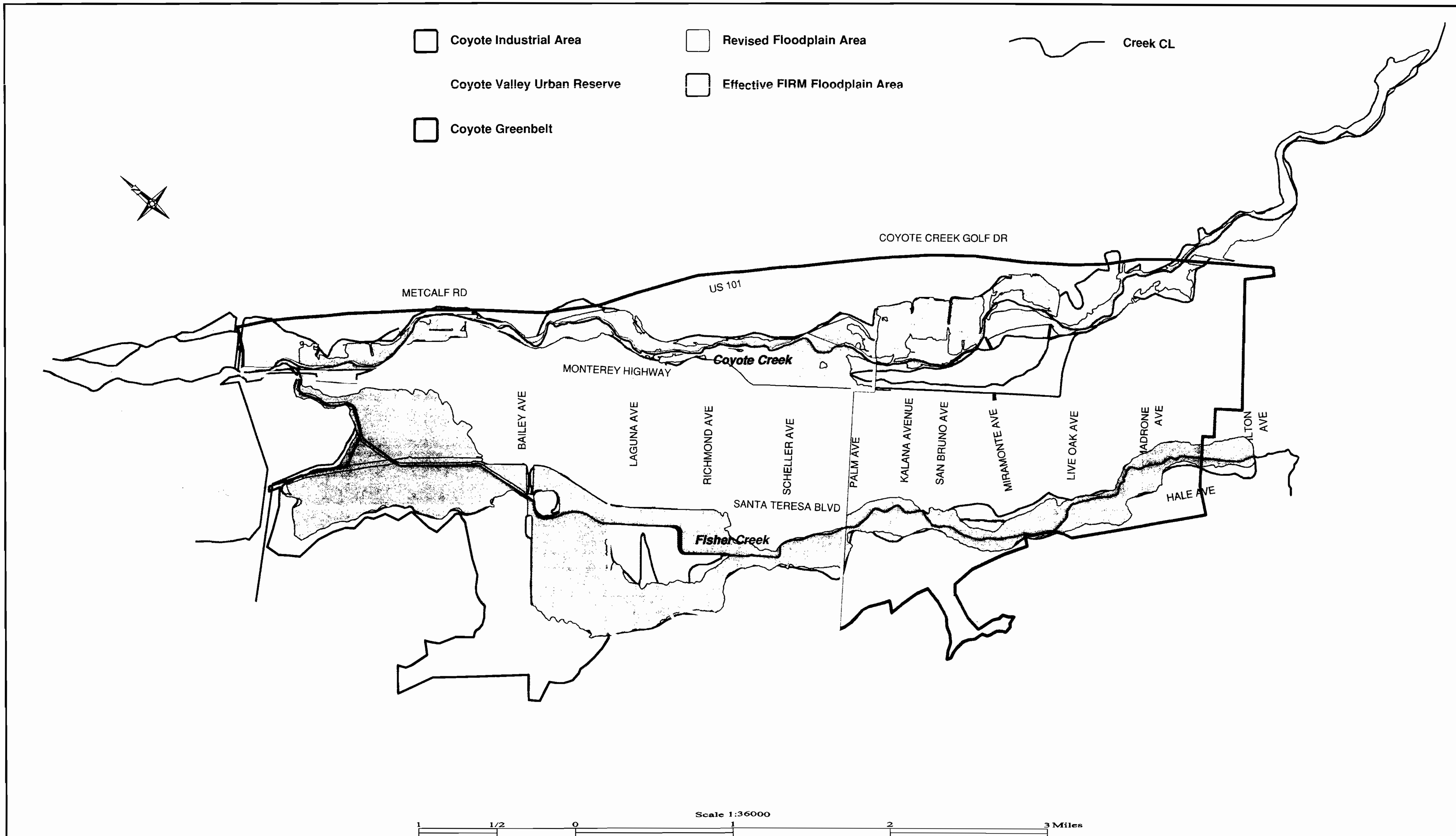
Figure 1-15: Oak Savanna near Laguna Seca

Coyote Creek is a perennial stream in most years, supported by low-flow environmental releases of stored water from Anderson Reservoir. With a better supply of water, this creek supports what the Santa Clara Valley Water District classifies as "narrow" and "sparse" riparian corridors along both of its banks.

1.2.3 *Significant Surface Water Hazards*

Surface water resources within Coyote Valley can potentially pose a threat to public welfare and property.

1.2.3.1 ***Flooding.*** During more extreme storm water runoff events, Coyote Valley is prone to flooding along both Coyote Creek and Fisher Creek. The most recent flood occurred in 1997 when Anderson Reservoir spilled and Coyote Creek overflowed its banks. The Federal Emergency Management Agency (FEMA) has applied hydrologic and hydraulic models to produce a set of maps that identify flood hazards within Coyote Valley. Their Flood Insurance Rate Map (FIRM) for Coyote Valley was first published in 1982, and remains the official effective document governing the National Flood Insurance Program (NFIP) as it is applied within the valley in both the City of San Jose and unincorporated Santa Clara County. The effective FIRM boundaries are outlined on Figure 1-16.



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MAPPED FLOOD HAZARDS
In Coyote Valley

1-16

The FIRM for Coyote Valley was prepared in the late 1970s using information available at the time. Subsequent to its publication, FEMA changed its policy regarding the flood protection provided by levees, which are artificial structures built above the natural ground to contain flood waters. Since 1988 FEMA's policy is to disregard any flood protection benefit provided by a levee that does not meet its standards for freeboard and geotechnical stability. (If a new FIRM were produced today, floodplain mapping would be based on hydraulic analyses that assume the existing levees along both Coyote Creek and Fisher Creek do not exist, since those levees do not meet NFIP standards.) To better understand current regulatory flood issues, additional analyses have been prepared to reflect the following:

- Revised watershed area. The effective Flood Insurance Study (FIS) hydrology model did not include a portion of the Fisher Creek watershed east of Monterey Road, roughly between Kirby Avenue and Cochrane Road. Portions of Morgan Hill also discharge to Fisher Creek.

- FEMA levee policy. The specific plan area includes agricultural levees along Fisher Creek. These levees do not have freeboard and are not owned or maintained by a public agency. The effective FIS analysis assumes that the levees would be overtopped, but would remain in place. FEMA levee policy implemented after the date of FIRM publication requires an alternative levee failure analysis.

- More current topography. The effective FIS is based on aerial photogrammetric cross-sections that do not include detailed topography. Coyote Valley Research Park, LLC obtained detailed topography for North Coyote Valley, which has been supplemented with new City of San Jose topography for the Urban Reserve and Coyote Greenbelt.

- Detailed overflow analyses. The effective hydrology model does not consider detailed overflows from Fisher Creek into the overbank areas. The model included only generalized storage relationships.

- Infrastructure improvements. There has been a road improvement project on Santa Teresa Boulevard, which was completed after the effective FIS was published. The road project raised the elevation of Santa Teresa Boulevard south of Fisher Creek and transformed it into a six-lane parkway. The project affected the overflow conditions for the levee-holding case, so this model was revised.

"Corrected effective condition" hydrologic models have been prepared based on levee holding and levee failure conditions. The levee failure model now includes a storage-discharge routing for Fisher Creek near Santa Teresa Boulevard.

Informational and policy changes have been incorporated to update the mapped special flood hazard area (SFHA) as described above and shown graphically on Figure 1-11 as shaded areas to indicate the estimated regulatory floodplain under existing conditions. Discharge values used in the analysis are listed in Table 1-1 for Fisher Creek (assuming the levee failure scenario, which results in the most widespread flooding) and Table 1-2 for Coyote Creek.

Table 1-1: Existing Condition Discharges on Fisher Creek

Location	Discharge (cfs)		
	2-year	10-year	100-year
Tilton Avenue	140	190	200
Willow Springs Road	300	520	780
Kalana Avenue	490	970	1,660
Palm Avenue	350	820	1,410
Richmond Avenue	520	1,150	2,110
Laguna Avenue	600	1,260	2,380
Bailey Avenue	690	1,340	2,640
SPRR / Monterey Road	540	810	1,520

Table 1-2: Existing Condition Discharges on Coyote Creek

Location	Discharge (cfs)	
	10-year	100-year
D/S Anderson Reservoir	4,500	15,000
U/S Fisher Creek Confluence	4,410	14,830
D/S Fisher Creek Confluence	4,410	14,850

Based on new hydraulic modeling, it appears that the approximate capacity of Coyote Creek is about 13,700 cfs through the plan area. Before Leroy Anderson Dam was constructed in 1950, recorded flows near Madrone (1.2 miles downstream from the dam) exceeded this capacity twice, once in 1903 and once on March 7, 1911 with a maximum flowrate of 25,000 cfs (still the flow of record). Figure 1-17 provides a historic trace of maximum annual discharge for Coyote Creek near Madrone, noting regulation by Anderson Reservoir.

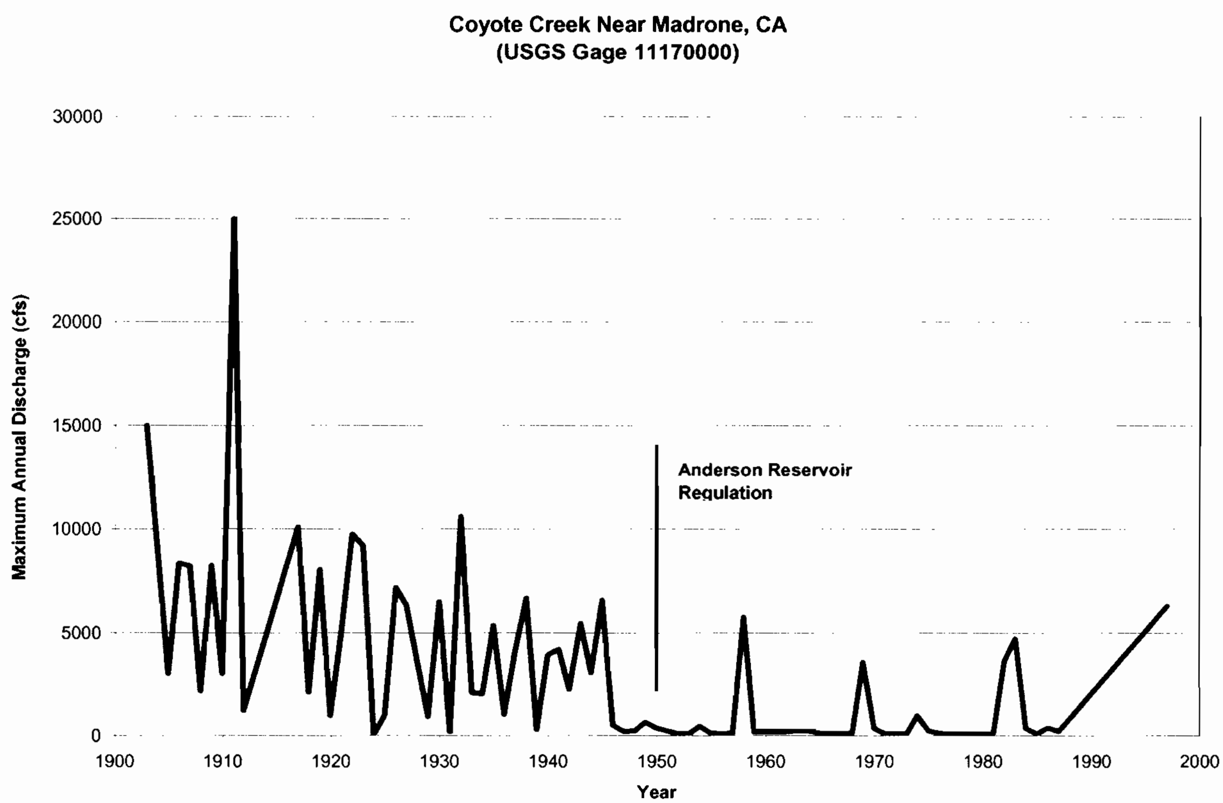


Figure 1-17: Historic Annual Maxima of Coyote Creek Discharge Near Madrone

Clearly Anderson Reservoir has had a significant impact on limiting the frequency and magnitude of extreme runoff events on Coyote Creek. Since the reservoir was put into operation, flows in excess of 5,000 cfs have only been recorded twice, with a maximum recorded uncontrolled spillway release of nearly 6,300 cfs in 1997. This release did cause significant flood damage downstream in San Jose near William Street and Interstate 280 (Chapter 2).

The published one-percent (100-year) discharge at this location is 15,000 cfs meaning about 1,300 cfs could spill into the western overbank upstream of the golf course. However, additional hydrologic modeling (Figure 1-18) shows that during extreme events, attenuation in Anderson Reservoir affects the timing of Coyote Creek overflows so that the spill would not add directly to the peak flow in Fisher Creek. Rather, the Coyote Creek spill would be attenuated and add to a flow of about 1,150 cfs in Fisher Creek and produce similar inundation along Fisher Creek as shown in Figure 1-16, which is mapped for a flow of 2,400 cfs at Richmond Avenue where the spilled flow would enter Fisher Creek. Between Monterey Highway and Fisher Creek, the Coyote Creek overflow would be at an average depth of less than six inches and would not be mapped as a special flood hazard area.

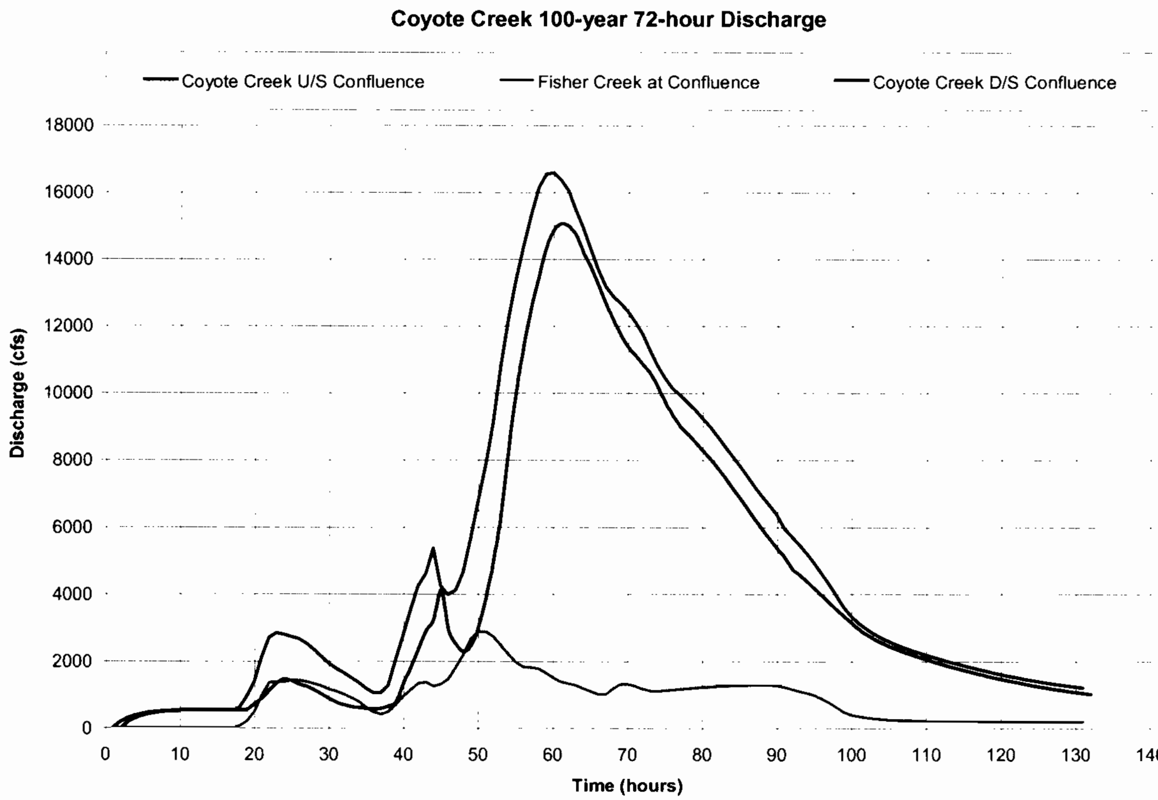


Figure 1-18: Coyote Creek and Fisher Creek Discharge at Narrows Confluence

Figure 1-18 also demonstrates that although the first significant peak of Coyote Creek's design hydrograph nearly coincides with Fisher Creek's peak discharge, the second (and larger) Coyote peak occurs as Fisher Creek is within its recession. This phenomenon is due to the relative size of the two watersheds and reservoir attenuation on Coyote Creek.

1.2.3.2 *Catastrophic Dam Failure.* The Plan Area is subject to deep inundation should Leroy Anderson Dam, which impounds Anderson Reservoir, fail catastrophically. Inundation maps prepared by the Santa Clara Valley Water District in 2002 indicate that the Plan Area could be inundated with water to depths approaching 20 feet within 30 minutes of dam failure.

The dam, however, has been designed and constructed to withstand maximum credible earthquakes on the San Andreas and Calaveras Faults of magnitude 8.3 and 6.9 on the Richter scale, respectively. Anderson Dam is inspected twice a year by the District in the presence of representatives from the California Division of Safety of Dams and the Federal Energy Regulatory Commission. So while potential inundation resulting from catastrophic dam failure could damage property and structures within Coyote Valley and pose a severe hazard to public safety, the probability of such failure is extremely remote and therefore not considered a significant hazard.[2]

1.3 Coyote Valley Groundwater Basin

Three linearly interconnected groundwater sub-basins make up the Santa Clara Valley Groundwater Basin: the Santa Clara Valley, Coyote Valley, and Llagas Sub-basins (Figure 1-19). The sub-basins occupy approximately the northern-most 44 miles of the Santa Clara Valley; a northwest trending feature situated at the southern end of the San Francisco Bay and bounded to the east by the Diablo Range and to the west by the Santa Cruz Mountains.

The Coyote Valley Basin is roughly 7 miles long and 2 miles wide, with a corresponding surface area of about 15 square miles. It is bounded to the north by the Coyote Narrows; a constriction in the permeable basin materials where the two bordering mountain ranges converge towards one another. It is defined at its southern edge by a proscribed boundary at Cochrane Road that generally coincides with a groundwater divide between the Coyote and Llagas Sub-basins. The Coyote Sub-basin generally drains north through the Coyote Narrows into the Santa Clara Valley Sub-basin, while groundwater in the Llagas Sub-basin drains to the south. Due to changes in conditions, the actual location of the groundwater divide between Llagas and Coyote has historically been observed to move as much as one mile to the north or south of the designated boundary at Cochrane Road. When the divide moves to the north, some water from Coyote will flow south into Llagas. Average flow from the Coyote Sub-basin to the Llagas Sub-basin is estimated to be approximately 2,400 acre-ft per year. [3]

[2] City of San Jose. Second Administrative Draft EIR. iStar General Plan Amendment and PD Zoning Project. October 2005, p. 176.
[3] State Water Resources Board Bulletin 7.

Figure 1-19: Santa Clara County Groundwater Sub-basins

1.3.1 *Basin Lithology*

Lithography refers to the physical makeup of sediments and rocks, and how their depositional history affects groundwater resources. Figure 1-20 shows the Coyote Basin's aerial geology, a transverse cross section, and a longitudinal cross section.

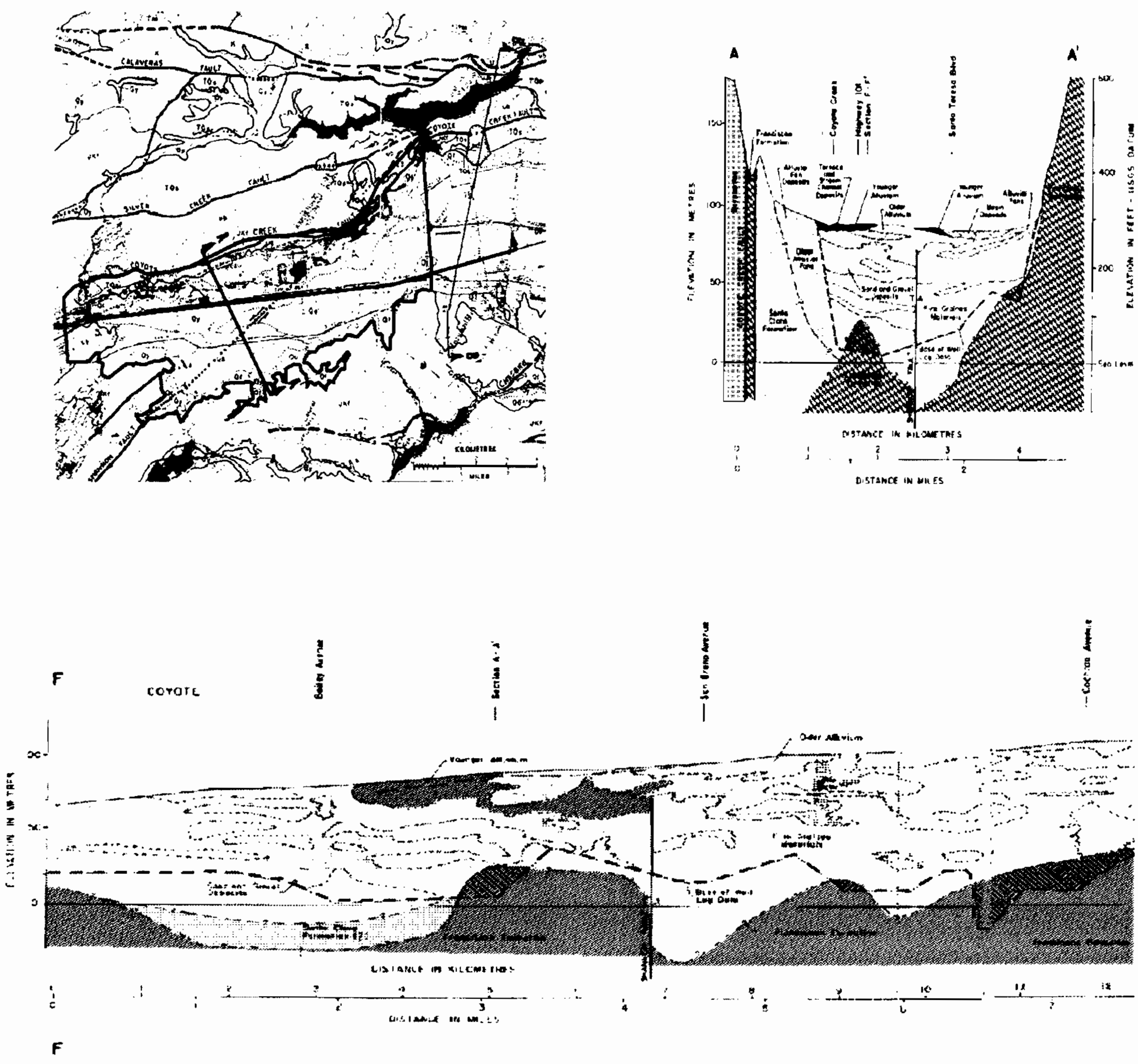


Figure 1-20: Aerial and Cross Sectional Geology of Coyote Valley

Water-bearing geologic formations in the Santa Clara Valley include rocks from the Pliocene through Holocene periods. The Franciscan Formation (shown in purple) – which outcrops in the Santa Cruz Mountains, the central part of the Diablo Range, near Coyote Narrows, and in the hills east of Coyote Creek – also underlies the Coyote Basin at depths of at least 160 feet. It is composed mostly of folded, faulted, and sheared marine sediments from the Jura-Cretaceous period, and has been estimated to be about 50,000 feet thick. The Franciscan Formation is not considered a significant source of groundwater, although DWR Bulletin 118-1 notes that it provided water to 25 wells in the South Santa Clara Valley (including the Coyote and Llagas Sub-basins) as of 1981.

The Santa Clara Formation (shown in green) is exposed in the hills to east side of Coyote Valley, and overlies the Franciscan Formation in much of the Coyote basin. It is a major water-bearing formation, possibly tapped by deeper wells in the Coyote Basin. It is composed of fairly well consolidated silt, clay, and sand with some zones of gravel, and may be inter-bedded with volcanic rocks in places. It is estimated to have a maximum thickness of around 1,800 feet. Available reports do not establish a depth to the surface for the upper surface, due to driller's log records not differentiating between it and overlying alluvial sediments.

Valley fill materials (shown in tans and grey) include alluvial fans, older and younger alluvium, basin deposits, and stream deposits. These materials make up the uppermost and principal water-bearing strata in the Coyote Sub-basin. Overall, the valley fill in Coyote is comprised of generally unconfined sand and gravel, with some discontinuous lenticular silt and clay deposits.

Essentially, the valley floor is made up largely of permeable materials that allow for the free recharge of surface water (resulting from direct runoff during storms) into the deeper water bearing layers. Permeability throughout Coyote Valley is not necessarily uniform, and certain locations provide more natural groundwater recharge than others (the bed of Coyote Creek being a prime example). The general trend of soil permeability is shown in Figure 1-21.

Permeability classifications based on the Soil Conservation Service's Hydrologic Soil Group classification system, furnished by the Santa Clara Valley Water District, are shown. Type "B" soil corresponds to moderate infiltration (0.15 to 0.30 inch per hour) including shallow loess and sandy loam. Type "C" soil corresponds to slow infiltration (0.05 to 0.15 inch per hour) including clay loams, shallow sandy loam, and soil high in clay content. Type "D" soil corresponds to very slow infiltration (0 to 0.15 inch per hour) including soils that swell when wet and heavy plastic clays.

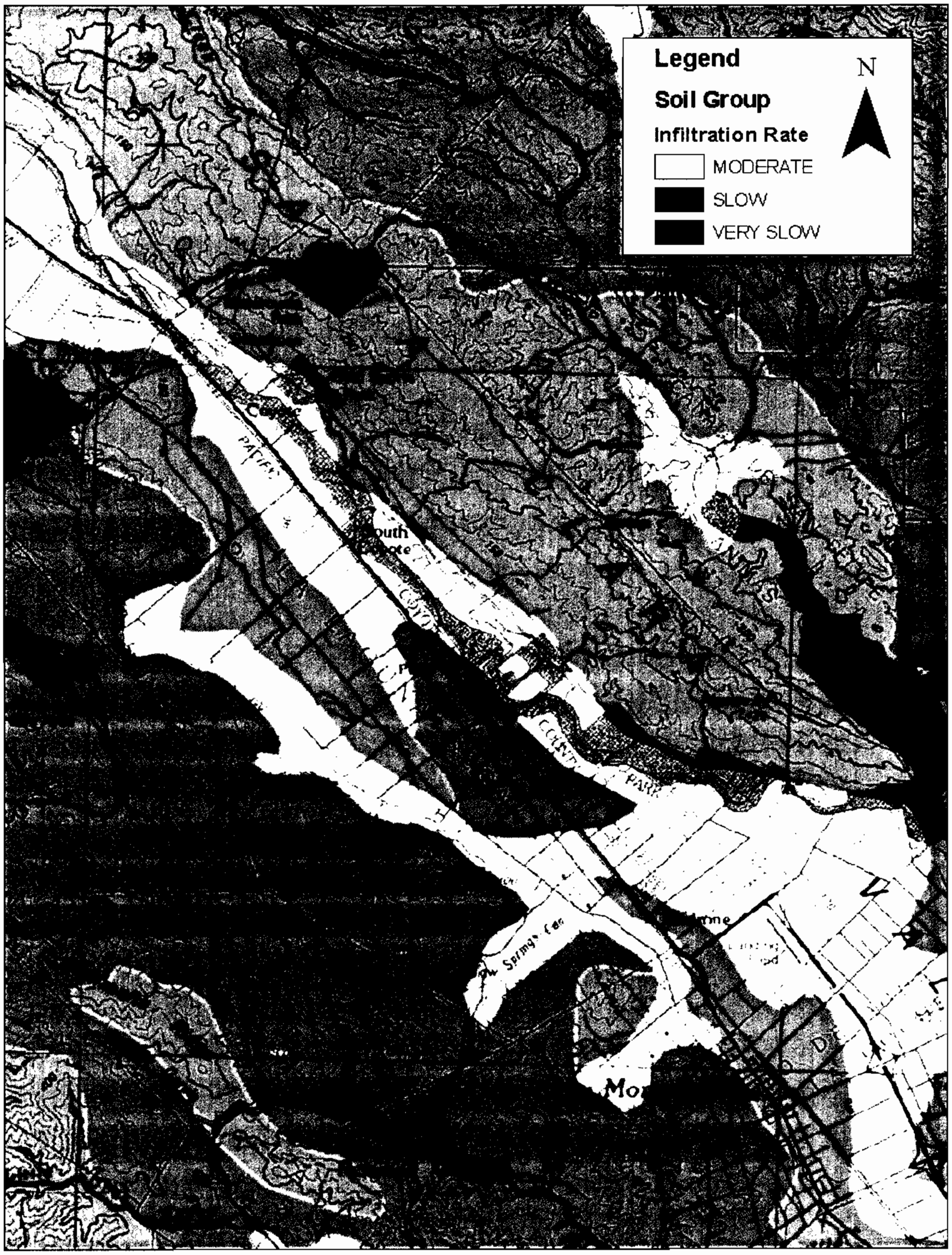


Figure 1-21: General Soil Permeability in Coyote Valley

Note that the beds of Coyote Creek and the original Fisher Creek provide for moderate infiltration, but the bed of realigned Fisher Creek does not. (The darker gray color along Coyote Creek and in some other locations is an artifact of overlaying the quadrangle image with other colors. It does not signify a different soil type.)

Alluvial fans that overly the Franciscan and Santa Clara formations are estimated to be between 3 feet and 25 feet thick. They are a heterogeneous mix of unconsolidated to semi-consolidated clay, silt, and sand, with some gravel lenses. Older and younger alluvium overly alluvial fans and older deposits, and are estimated at up to 125 and 100 feet thick respectively. They are composed of unconsolidated silt, sand, and clay deposited as ancient flood plain, with sandy gravel deposits occurring in areas of ancient stream channels (these are shown with grey coloration on the cross sections). Older alluvium is distinguished from younger alluvium by its dense clayey subsoil which retards vertical movement of water and has low recharge potential. Groundwater is generally unconfined in the younger alluvium and ranges from unconfined to locally confined in the older alluvium. Within the older and younger alluvium deposits in the Coyote Sub-basin are two networks of interconnected buried stream channels left behind by an ancient Coyote Creek. The older network is found at elevations below about zero feet, and follows the path of a southward flowing Coyote Creek; while the upper system, found at elevations above about zero feet, follows a later, northward flowing Coyote Creek.

Basin deposits are fine-grained unconsolidated silty and sandy clays, with areas of plastic and organic clays. Basin deposits are found in low-lying areas at thicknesses up to 100 feet in the Santa Clara Valley, and are specifically found in North Coyote. They have low infiltration rates, are prone to ponding during the rainy season, and can act as a confining layer to underlying deposits. Stream deposits are unconsolidated sand, gravel, and cobbles, with little or no silt and clay. They are up to 50 feet thick and occur in and around stream channels in the Coyote Basin. They have a high infiltration rate and facilitate the recharge of deeper water-bearing layers.

Due to a lack of verifiable data for the area, the depth to bedrock of the basin is unconfirmed. DWR Water Bulletin 118-1 presents elevation contours of the lower surface of valley fill materials based on well driller's logs. These contours show the base of the alluvial deposits to range from elevation 0 to 200 feet; placing the Valley Fill depth at a maximum of about 390 feet.

1.3.2 *Groundwater Resources*

An examination of "existing groundwater conditions" within the Coyote Valley Sub-basin is somewhat of a misnomer. As described previously, the climate in Santa Clara County is semi-arid, with periods of low rainfall and drought alternating with average, above-average and wet years. Groundwater conditions in Coyote Valley are very sensitive to seasonal precipitation. Hence groundwater characteristics during any single year are not necessarily indicative of conditions in previous or subsequent years, and a longer period of record is needed to assess "existing conditions".

1.3.2.1 ***Historic Measures.*** When dealing with groundwater conditions, the Santa Clara Valley Water District uses the following concepts in its planning and management arsenal, where water supplies are the primary concern:

Long Term Average	Mean (average) value from the entire period of record
Single Dry Year	The minimum operationally usable supply available during the historic record. For Coyote Valley the single dry year is 1977.
Critical Dry Period	The driest period reasonably expected to occur; a long term drought with no carry-over storage. The District has assigned a one-percent probability to a ten-year drought as the critical dry period. For Santa Clara County and Coyote Valley, this period is equivalent to the 1987 – 1992 drought extended another five years.

1.3.2.2 ***Groundwater Basin Balance.*** Existing and historic conditions in the Coyote Valley Sub-basin are best examined through the concept of basin balance. A basin is said to be in balance when the volume of water entering a basin is equal to the volume of water leaving the basin, over a specified period of time (usually a year). This concept is also often referred to as a "groundwater budget". Should either the input or output of water from a basin fall out of balance, groundwater levels within that basin will rise or fall in response. Groundwater basins where the output of water exceeds the input of water over a number of years are said to be "mined".

In 2000 CH2M-Hill prepared a Coyote Valley groundwater budget for the Metcalf Energy Center, representing average conditions from 1988 to 1999. This time period experienced wet, average and dry year conditions, and because the time frame experienced one half of a critical dry period, provides a relatively conservative water budget. CH2M-Hill found the Coyote Valley Sub-basin to essentially be in rough balance, with inflows to the basin exceeding outflows from the basin by two percent. Figure 1-22 shows the water budget graphically. A discussion of individual basin balance components follows.

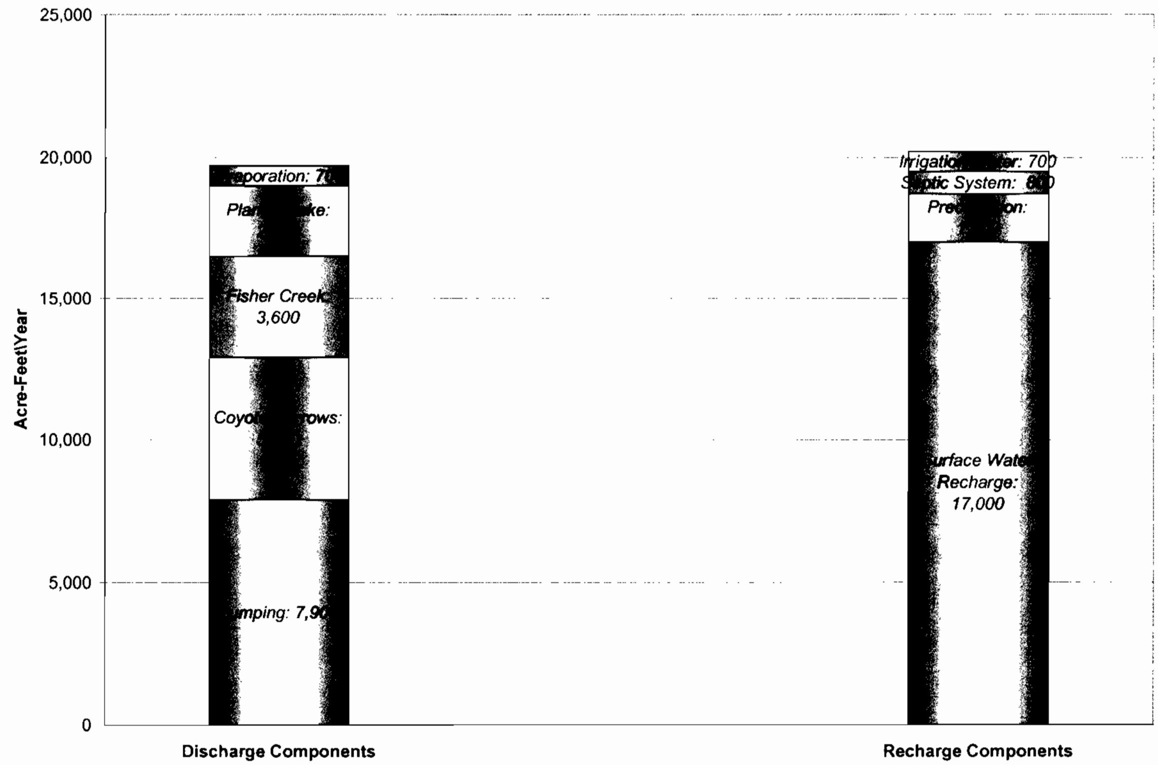


Figure 1-22: Coyote Valley Groundwater Budget (CH2M-Hill, 2000)

1.3.2.2.1 ***Discharge Components.*** Discharge components refer to water uses or losses within the groundwater basin. They include in order of magnitude: direct groundwater extractions (i.e. pumping); subsurface outflow through the Coyote Narrows; discharges to surface water (e.g. Fisher Creek); direct consumption by plants, and the direct evaporation of surface water.

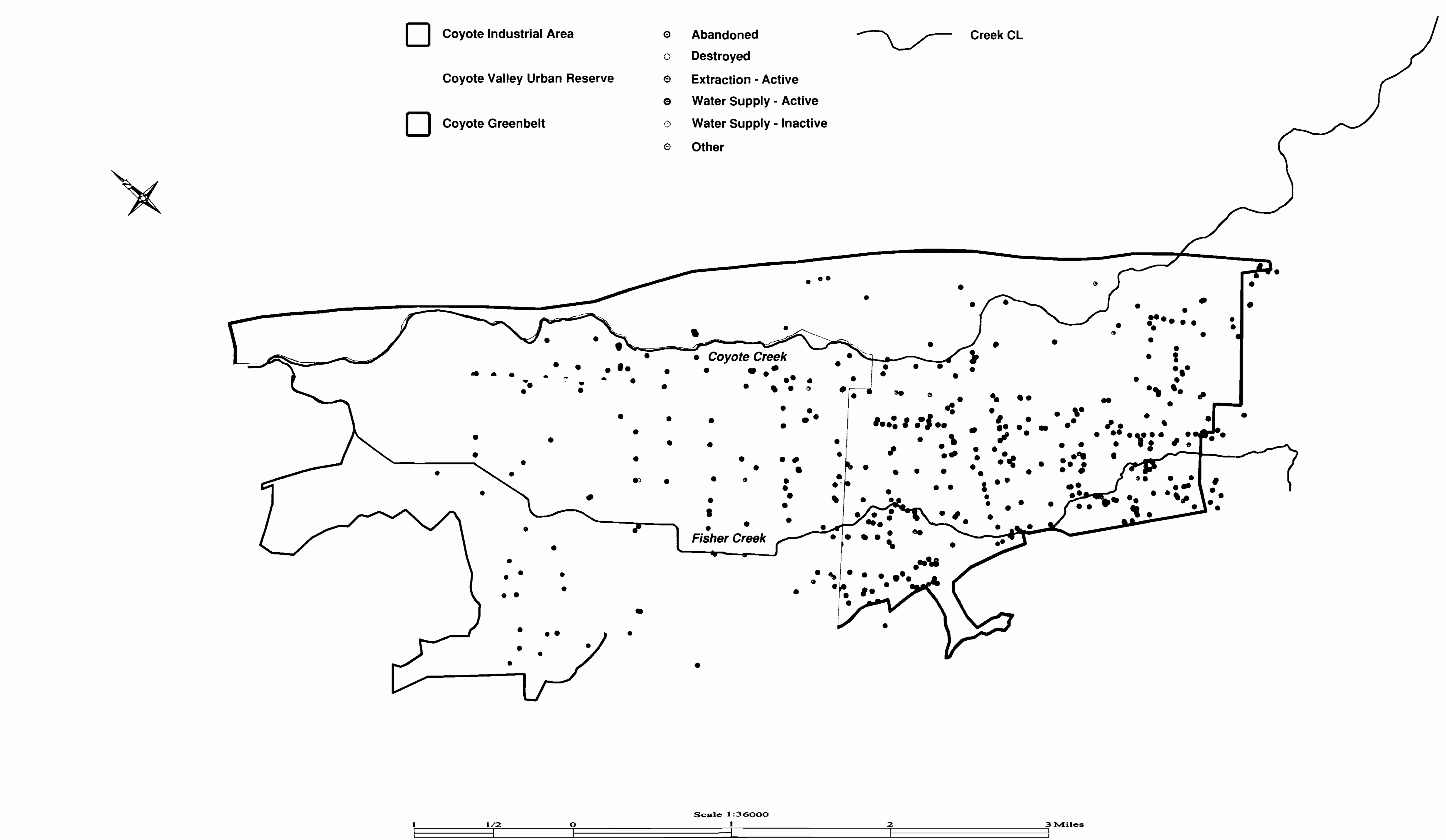
Pumping

The District has records for 619 production wells in Coyote Valley. Although many of the wells in Coyote Valley are not metered, the majority of groundwater used comes from metered wells. Where meter data is not available, groundwater production has been estimated using efficiency or flow testing, power use, and/or crop factors. Table 1-3 summarizes District-reported pumping in Coyote Valley from 1989 to 2004. (Roger Pierno, SCVWD Groundwater Management Unit.)

Table 1-3: Historic Groundwater Pumping in Coyote Valley

Year	Pumping (acre-feet)
1989	6,011
1990	6,609
1991	6,433
1992	6,152
1993	6,104
1994	6,537
1995	6,693
1996	6,592
1997	8,004
1998	6,918
1999	7,786
2000	7,231
2001	6,947
2002	6,740
2003	6,800
2004	7,200

Figure 1-23 shows the locations of active and abandoned production wells in Coyote Valley, based on District records. Production tests for wells are generally confidential, but experience within the valley suggests that very robust wells with capacities on the order of 2,000 gallons per minute or more may be completed in the water bearing strata with little drawdown. The aquifer's hydraulic conductivity is generally very good to excellent, depending upon where a well is actually drilled. Ancient creek meanders and the gravels deposited by them and some luck play roles in determining individual well production.



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PRODUCTION WELLS
In Coyote Valley

1-23

Subsurface Outflow

This discharge component is the most difficult to quantify since the discharge cannot be directly measured. Discharge through the Narrows has been estimated by others in the past:

6,200 acre-feet per year for 1983-84 (Harding Lawson Associates, 1985)
4,400 acre-feet per year for 1984-85 (SCVWD, 1989)
5,000 acre-feet per year based on hydrogeologic conditions (CH2M-Hill, 1992)

Discharge to Surface Water

The natural condition of Coyote Creek is to lose water to the groundwater basin upstream of the Coyote Creek Golf Course. The natural gradient of the basin is away from Coyote Creek and toward Fisher Creek to the west and north. The underground basin becomes generally thinner and shallower near the Narrows, causing groundwater to influence surface water conditions. CH2M-Hill estimates that the base flow component of Fisher Creek is 300 acre-feet per month, or 3,600 acre-feet per year. This represents the flow of water in Fisher Creek not attributed to direct rainfall runoff. There does not appear to be a strong component of groundwater discharge to Coyote Creek, and CH2M-Hill neglected this in their groundwater budget.

Direct Consumption by Plants

Plants in wetland and riparian areas within Coyote Valley can directly use available soil moisture to build tissue. This type of plant is referred to as a phreatophyte, and CH2M-Hill assumed a consumption of 4 acre-feet per acre of riparian or wetland habitat to estimate a total direct consumption of 1,900 acre-feet per year for native plants.

Crops and other vegetation within shallow groundwater areas (especially Laguna Seca) also directly consume groundwater from the basin. Assuming the rate of use for these plants mimics water demand for irrigated grass pasture within interior valleys (45 inches per year); CH2M-Hill estimated an annual loss of 600 acre-feet for this discharge category.

Direct Evaporation

Open water surfaces in Coyote Creek, Fisher Creek, various ponds, golf course lakes, and old gravel pits have been estimated to lose 740 acre-feet of water every year.

1.3.2.2.2 ***Recharge Components.*** Recharge components refer to water gains within the groundwater basin. They include in order of magnitude: direct surface water recharge (natural and artificial); the deep percolation of precipitation; septic system discharges to groundwater; and the deep percolation of irrigation return water.

Natural Recharge

Unmanaged natural sources of recharge to the Coyote Sub-basin include rainfall, pipeline leakage, net irrigation return flows to the basin, underground seepage from the surrounding hills, and infiltration of flow in streams which drain areas of the Santa Cruz Mountains to the West[4]. Of these, deep percolation of rainfall accounts for most of the natural inflow to Coyote[5].

The majority of basin recharge (85 percent) under current conditions is from direct surface water recharge. Coyote Creek and Coyote Canal are the only surface water bodies that can recharge water from outside of the basin limits (artificial recharge discussed below). Available research indicates that Fisher Creek receives water from the groundwater basin, but does not provide appreciable recharge in return due to its relatively small watershed and the presence of a confining layer (particularly in the north). The open bodies of water (lakes, gravel pits, etc.) that evaporate water from the basin are also available to directly infiltrate rainwater in lesser amounts. (As described earlier, annual evaporation is more than double mean annual precipitation.)

Because irrigation returns and pipeline leakage are difficult to measure, the District estimates total natural recharge to the Coyote Sub-basin using the following change in storage equation:

{Natural Recharge + Artificial Recharge} – {Groundwater Pumping}= (Change in Storage}[6]

The calculation of recharge using this equation is limited because many wells in the Coyote area are not metered, and because the District does not use a verified dynamic groundwater model to determine change in storage. Due to the resulting uncertainty as to the accuracy of pumping and change in storage estimates, the District currently has no reliable estimate of natural recharge for the Coyote Sub-basin,[7] however Table 1-4 presents estimates of natural recharge for four hydrologic scenarios used in groundwater supply planning.

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[4] DWR Bulletin 118-1
[5] SCVWD Groundwater Conditions 2001, p. 8
[6] SCVWD Groundwater Conditions 2001
[7] Pers comm. w/ Roger Pierno 10/3/2003

Table 1-4: Estimated Natural Groundwater Recharge

Hydrologic Scenario	Estimated Natural Recharge (Acre-feet)
Wet Year	4,000
Long Term Average	2,600
Single Dry Year	1,600
Critical Dry Period	2,400

Source: SCVWD Urban Water Management Plan 2005 p 30.

Artificial Recharge

The District has the ability to facilitate enhanced groundwater recharge to all three of the Santa Clara County groundwater basins through 80 of its 90 miles of stream channels and 71 off-stream ponds. The recharge program consists of both releasing locally stored and imported water into District streams and ponds, and managing and maintaining the streams and ponds to ensure continued recharge. The District actively supplements natural recharge to the Coyote Sub-basin with "artificial" recharge operations in Coyote Creek. Like natural recharge, artificial recharge of Coyote occurs through infiltration of streamflow in Coyote Creek. (Figure 1-24 shows natural and artificial recharge in Coyote Valley diagrammatically, and also indicates the general direction of groundwater flow throughout the basin.)

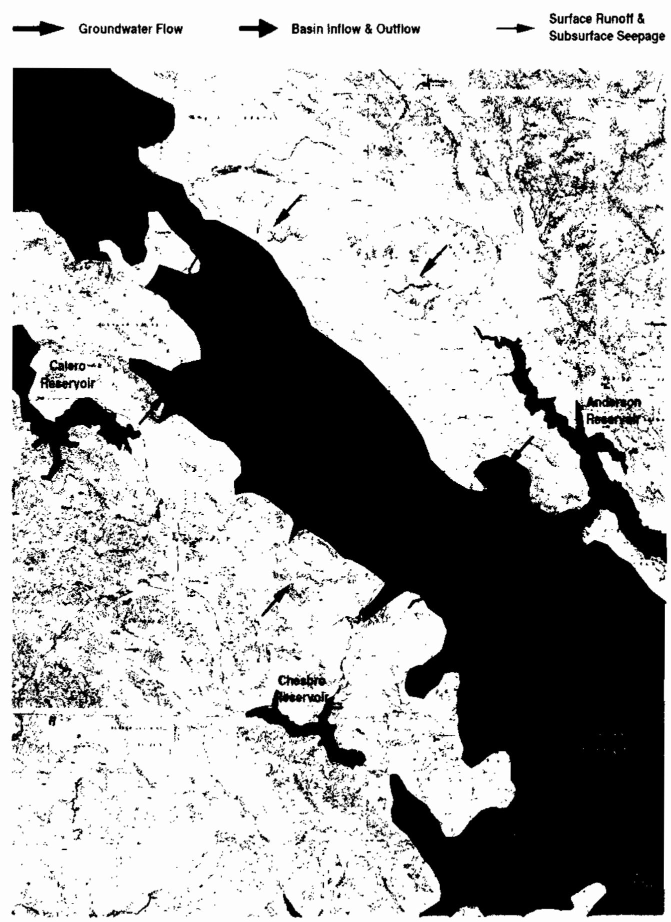


Figure 1-24: Recharge in Coyote Valley

The District manages the amount of water artificially recharging Coyote by releasing water stored in Anderson Reservoir to maintain streamflow during dry months and low streamflow periods. Artificial recharge volumes for calendar years 1998 to 2004 are presented in Table 1-5, noting that there is roughly a 15 percent difference between these figures and the CH2M-Hill estimate for total surface water recharge.

Table 1-5: Artificial Recharge to Coyote Sub-basin[8]

Calendar Year	Artificial Recharge (acre-feet)
1998	8,180
1999	9,891
2000	8,042
2001	8,412
2002	11,737
2003	7,200
2004	8,500

Miscellaneous Recharge

The California Department of Water Resources estimates that a little more than two inches of rainfall over the Coyote Valley floor reaches the groundwater aquifer through deep percolation, providing about 1,700 acre-feet of supply to the basin every year.

About ten percent of agricultural irrigation water returns to the aquifer through deep percolation, and about half of all residential water uses from the aquifer return as septic system discharge. Septic discharges are filtered through sandy soils and unconsolidated deposits before reaching the water table, similar to a slow sand filtration system found in a water treatment facility.

1.3.3 *Groundwater Levels*

Groundwater levels respond to changes in the balance between groundwater recharge and withdrawal, and indicate the relative amount of water stored in an aquifer at a given point in time. The District maintains groundwater elevation data for monitoring wells in the Coyote Sub-basin dating back to 1937. Because most wells were designed as production wells, they are screened at multiple depths, and therefore elevation data represents an average of the conditions in the various water-bearing formations. Data is currently collected monthly for index wells and quarterly for other

[8] Personal communications w/Roger Pierno, Groundwater Management Unit, SCVWD.

monitoring wells. The District has selected three index wells in the Coyote Sub-basin, chosen because elevations in these wells are considered representative of conditions and trends in the sub-basin as a whole. A monitoring well at Palm Avenue has been selected as representative of groundwater basin trends over the longest period of time. Figure 1-25 superimposes groundwater elevations at this monitoring well and a graph of long-term rainfall patterns as measured in San Jose.

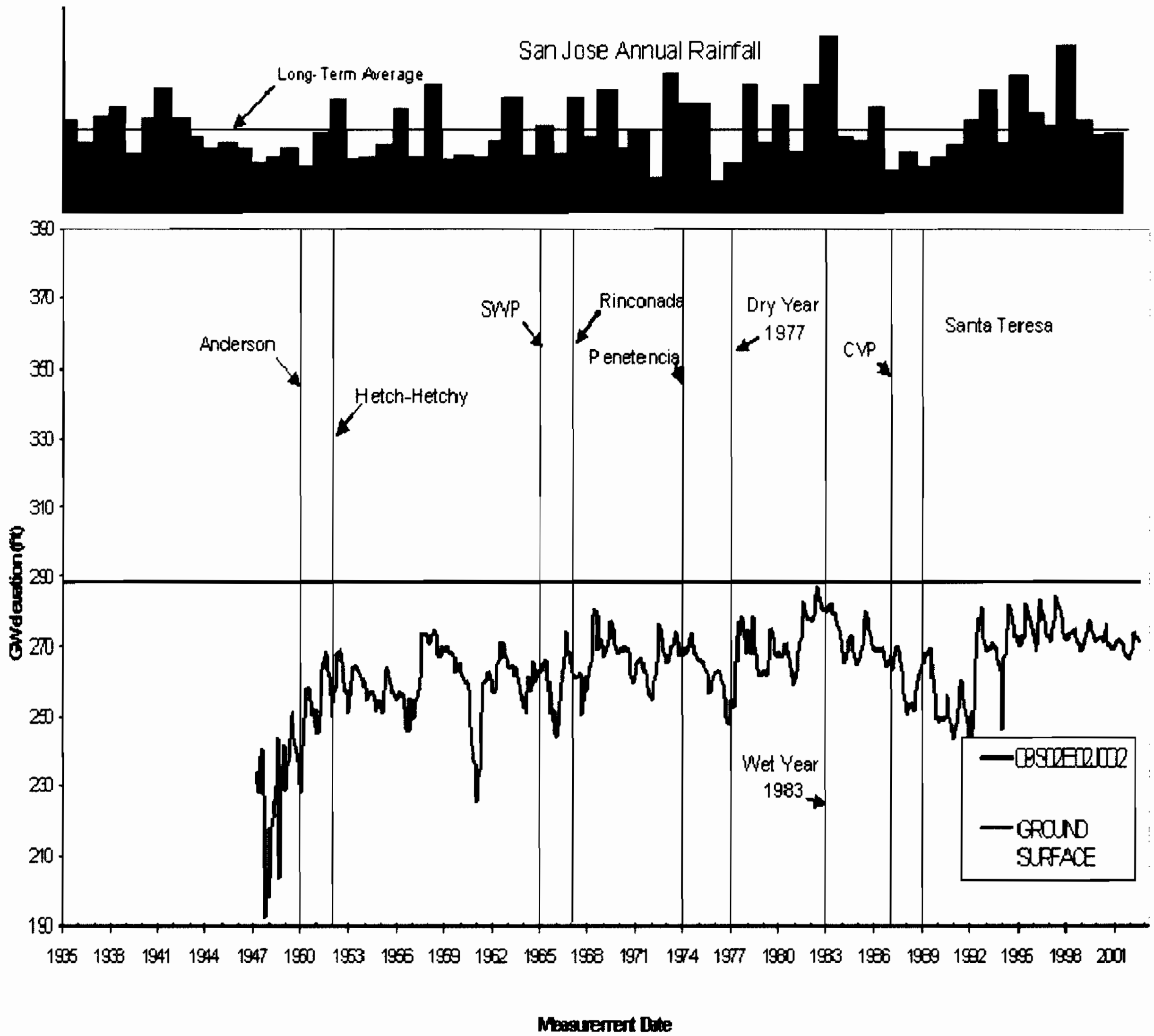


Figure 1-25: Historic Groundwater Levels in Coyote Valley

As demonstrated in the groundwater elevation graph, groundwater levels in Coyote Valley are very responsive to the stimuli of rainfall and artificial recharge. By 1937, when the District began to monitor water levels in Coyote Valley, groundwater had been used as a water supply source for more than 80 years. Subsidence of nearly four feet had been recorded in San Jose; and the Almaden, Calero, Guadalupe, Stevens Creek, Vasona, and Coyote dams had been constructed to store excess winter streamflow for dry-month releases into recharge facilities. Countywide groundwater levels increased from the late '30s into the beginning of the below-normal precipitation in 1944. Between 1944 and 1950, a combination of low precipitation and use of groundwater for almost all of the county's water needs corresponded to an extreme drop in groundwater elevations in Coyote. In 1950, construction of Anderson Dam was complete. In 1952 the county began importing Hetch-Hetchy water, however, the county population doubled between 1950 and 1960, and water levels in the northerly Santa Clara Sub-basin declined.

Levels in the Coyote Sub-basin remained relatively stable during this period, however. In the early 1960s the district contracted with the State for an entitlement of 100,000 acre-feet per year through the South Bay aqueduct. In 1967 the District began delivering surface water treated at the new Rinconada Water Treatment Plant (WTP) to north county residents, reducing groundwater extraction and allowing for some basin recovery. Between 1960 and 1970, the county population again doubled. In 1974 Penetencia WTP began delivering treated water to some county residents, reducing some of the demand for groundwater. In 1987 delivery of water from the Central Valley Project began, and in 1989 the Santa Teresa WTP began treating and delivering surface water.

Minimum levels in the three Coyote Valley index wells were recorded in the late 1940s. Since then, elevations in two northernmost wells have gradually increased. The fact that elevations in the southernmost well do not show the same trend may be due to the effects of the cone of depression from nearby pumping. Maximum groundwater levels were recorded in all three index wells in the spring of 1983. Table 1-6 summarizes long-term groundwater data for the Palm Avenue Index Well (Well Number 09S02E02J002 at ground elevation 287 feet, with a total of 623 measurements in the District's records beginning on Jan 14, 1948.)

Table 1-6: Groundwater Levels at Palm Avenue Index Well

	Depth to Water (feet)
Average	23.5
Minimum	0.0
Maximum	95.1
Standard Deviation	12.3

1.3.3.1 *Historic Trends.* Water levels in the Coyote basin respond quickly to changes in circumstances and precipitation. For example, the index wells show a substantial drop in water levels in response to the low precipitation of 1977; however by the fall of 1979, after a period of above-average rainfall, water elevations had recovered to pre-drought levels. Similarly, water levels throughout the basin increased substantially in response toe the above average precipitation of 1982-1983; but by the spring of 1985 after a period of below average rainfall, were back to pre-wet conditions. Figure 1-28 presents contours for the groundwater basin in response to the drought conditions of 1976-77 and long term fall averages for the basin.

Figure 1-29 presents contours for the groundwater basin in response to the wet conditions of 1982-83 and long term spring averages for the basin. The basin also responds quickly to changes in precipitation between the wet and dry seasons each year. Figure 1-29 presents a graph of average spring and fall water levels over the period of record to show a "normal" range of groundwater elevations over the course of a year.

Figures 1-26 and 1-27 show similar groundwater contour information, but in a different format. The figures depict, respectively, the long-term average depth to groundwater (as measured in feet from the ground surface) during the fall and spring. Both fall and spring groundwater tables become shallower toward the Narrows. Note also that the long term average spring condition shows groundwater at the surface (depth 0) in Laguna Seca.

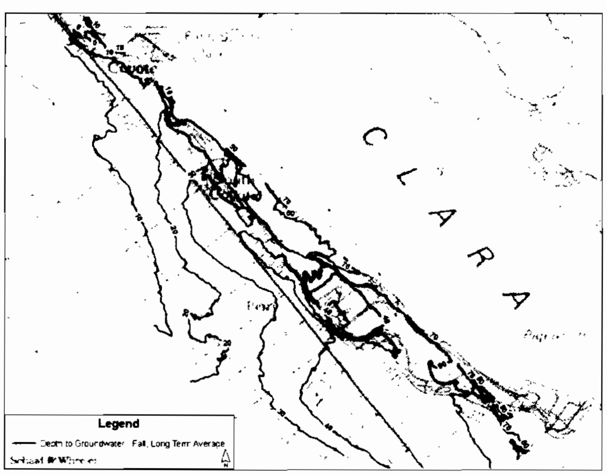


Figure 1-26: Avg. Depth to Groundwater in Fall

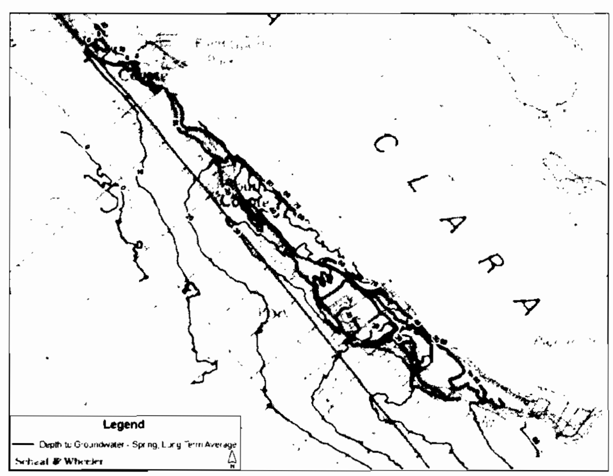
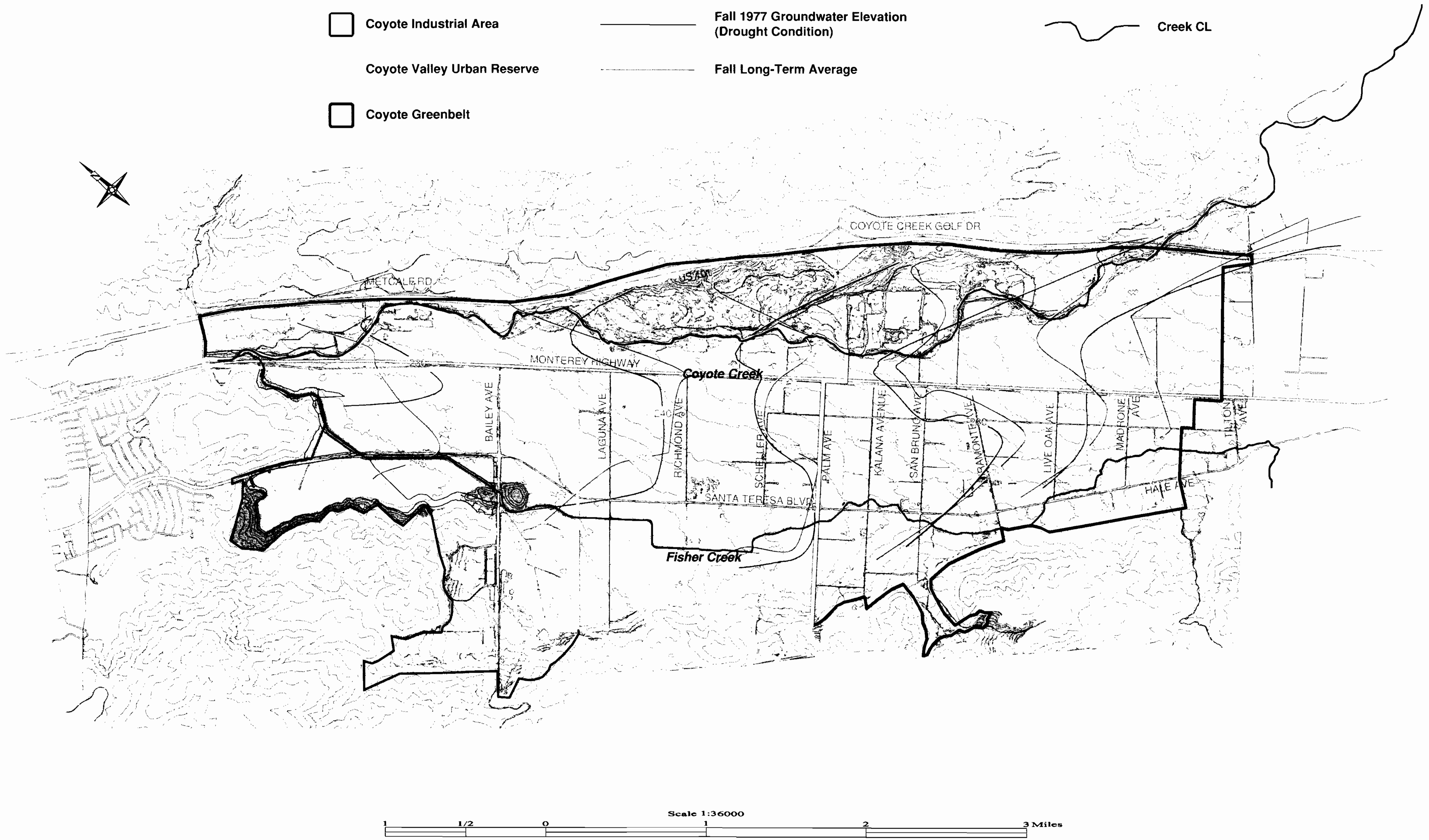


Figure 1-27: Avg. Depth to Groundwater in Spring



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GROUNDWATER SURFACE
Under Drought Conditions

1-28

Coyote Industrial Area

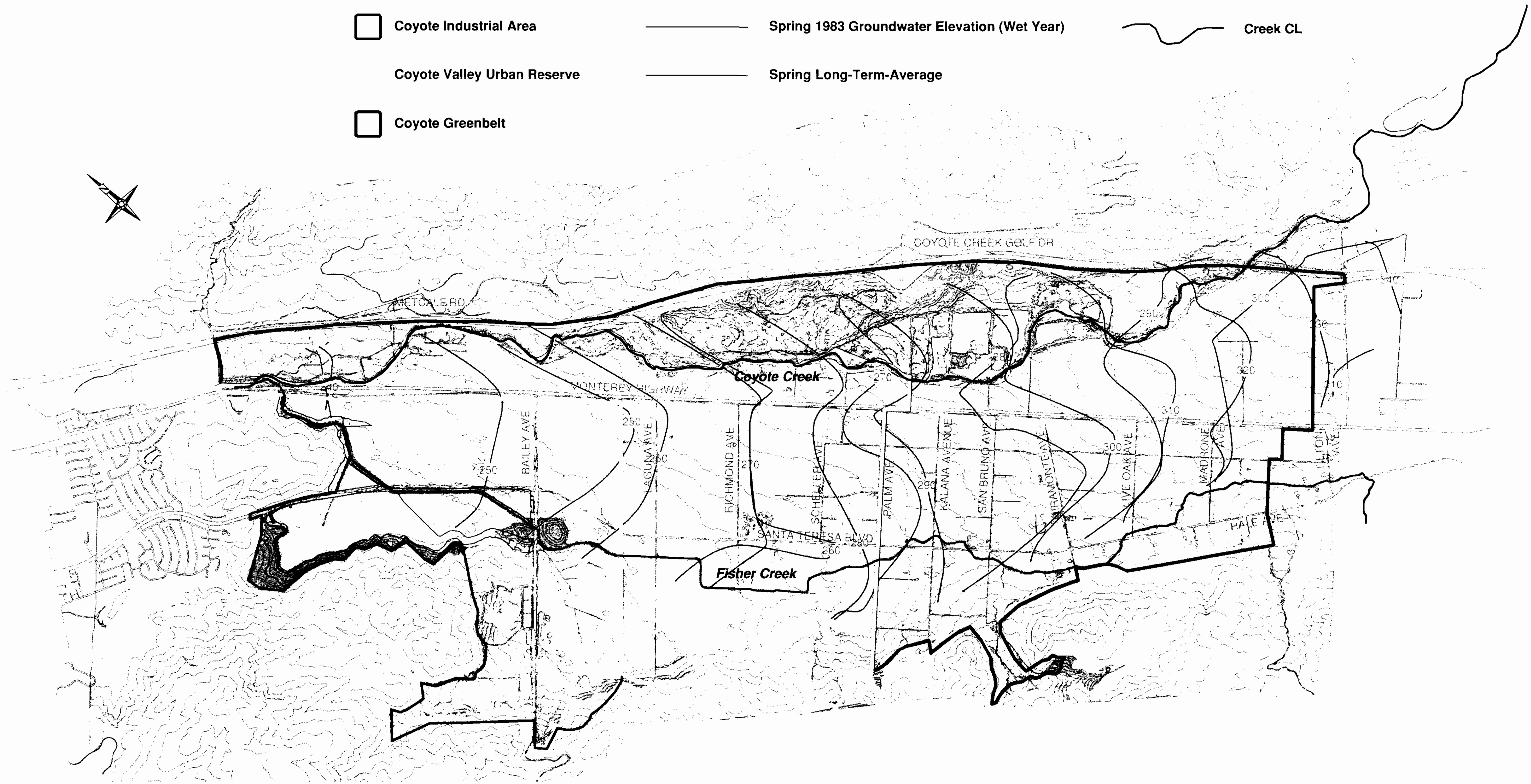
Coyote Valley Urban Reserve

Coyote Greenbelt

Spring 1983 Groundwater Elevation (Wet Year)

Spring Long-Term-Average

Creek CL



Scale 1:36000

1 1/2 0 1 2 3 Miles

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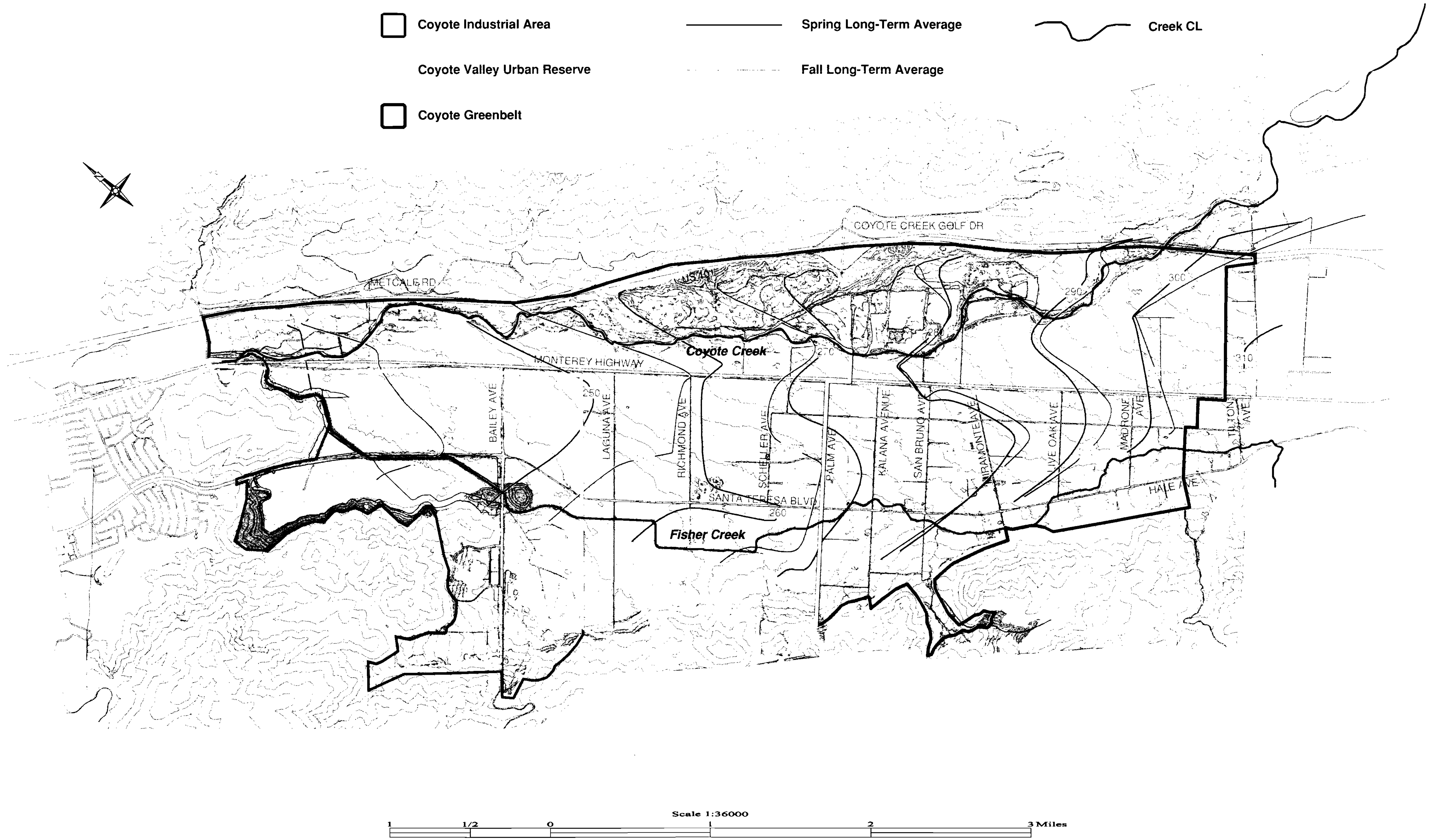
GROUNDWATER SURFACE
Under Wet Conditions

1-29



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GROUNDWATER SURFACES
Long-Term Averages
Spring & Fall

1-30

1.3.4 *Groundwater Storage*

In April of 2002 the District released a report on a study of the operational storage capacity within the Coyote and Llagas Sub-basins. Because the District has not always used a dynamic groundwater model to simulate conditions in the Coyote Basin, estimates of operational storage are made based on the volume between two sets of groundwater elevation surfaces in the basin. The District's analysis is based on groundwater surfaces from the drought of 1976-1977 and the wet conditions of 1982-1983. Operational storage is calculated using the equation:

$$V = Sy * A * \Delta h$$

Where:

V = volume of groundwater available from storage (operational storage capacity)

Sy = specific yield (volume of water an unconfined aquifer releases from storage per unit surface area per unit decline in the water table

A = cross sectional aquifer area

Δh = difference in elevation between high and low groundwater surfaces

The analysis is limited by the accuracy of specific yield values used for the aquifer. Two sets of specific yield values are used; one from DWR Bulletin 118, and another from previous estimates made by the District. (The origin of both sets of specific yield values is unclear.) Additionally, a constant specific yield is assumed for the entire vertical column under a particular node, ignoring differences in specific yield attributable to the heterogeneity of aquifer materials.

Using the above equation and the two sets of specific yield values, the District estimates operational storage capacity in the Coyote Sub-basin to be between 23,000 and 33,000 acre-feet. Thus, if water is not recharged to the basin through rainfall, runoff and/or reservoir releases, the basin would run dry in one or two years with current average discharges.

1.4 Water Quality

Overall groundwater quality is good in Coyote Valley, with levels of most contaminants monitored falling below maximum level standards for the various beneficial uses of groundwater as defined by the Regional Water Quality Control Board. Typical concentration ranges for common inorganic constituents in the Coyote Sub-basin, together with agricultural water quality objectives and California Title 22 Drinking Water standards are presented in Table 1-7.

Table 1-7: Water Quality Data for Coyote Valley

Constituent	Coyote Sub-basin	Drinking Water Standard[9]	Agricultural Objective[10]
Aluminum	<50	1000	5000
Arsenic	<2	50	200
Barium	<126	1000	-
Beryllium	<1	4	500
Boron	<132	-	200
Bromide	.09 - .16	-	-
Cadmium	<1	5	50
Calcium	28-56	-	-
Chloride	27-35	600	335
Chromium, Total	<12	50	1000
Copper	<50	1000	500
Fluoride	.14-.21	1.7	2
Hardness	205-330	-	-
Iron[11]	<5	300	20000
Lead	<5	15	100
Magnesium	24-60	-	-
Manganese	<20	50	10000
Mercury	<1	2	-
Nickel	<10	100	2000
Nitrate	10-47	45	135[12]
Selenium	<5	50	20
Silver	<10	100	-
Sodium	22-28	-	-
Specific conductance	373-680	2200	3000
Sulfate	31-52	600	-
Total Dissolved solids	330-400	1500	10000
Zinc	<50	5000	10000

Source: SCVWD Groundwater Conditions 2001 pg 46

1.4.1 *Nitrate Hazard*

Nitrate is a problem to some extent in the Coyote Valley Sub-basin, and more of a problem within the Llagas Sub-basin to the south, where concentrations above the maximum contaminant level (MCL) of 45 mg/l (or parts per million) as NO_3 have been found in many private wells. A diagram of nitrate concentrations measured in 2001 is provided as Figure 1-31. (Large red dots indicate wells with nitrate levels that exceed state drinking water standards.)

[9] Maximum contaminant Level (MCL) specified in Title 22 of the California Code of Regulations

[10] Agricultural water quality objective in the 1995 Water Quality Control Plan for the San Francisco Bay Basin, Regional Water Quality Control Board

[11] Detection limit for iron varied from 5 ug/L to 100 ug/L..

[12] Nitrate Agricultural Objective: 30mg/L NO3 +NO2 (as N), approximately equal to 135mg/L

In response the District implemented a nitrate management program to monitor, track and manage nitrate contamination. Studies in 1992 and 1997 found that nitrate concentrations in the Llagas Sub-basin are generally increasing over time while concentrations in Coyote Valley have remained fairly constant. Major sources of nitrate loading were found to be fertilizer used in agriculture, and animal and human waste generation. Although recently more agricultural land in the South County has been converted to residential use, nitrate concentrations in groundwater may continue to increase and or remain steady due to residual nitrate in the soil from prior use and the slow movement of water from the surface to the water table.

There are no public sewer systems within the Coyote Greenbelt and not all septic leach fields were approved by the County Department of Health Services when they were constructed. Seasonally high groundwater elevations during wet periods may have exacerbated the transmission of nitrate loading from sanitary leaching systems to water bearing formations and eventually to groundwater wells. Poor sanitary seals at individual well casings may also contribute to this problem.

Over half of the 600 private wells tested in the Llagas and Coyote Valley Sub-basins in 1997 exceeded the federal safe drinking water standard for nitrate, although all public supply water wells meet drinking water standards.[13]

1.4.2 *Perchlorate Hazard*

Perchlorate, a chemical used in rocket fuel and highway flares, has been detected in the Llagas Sub-basin south of Coyote Valley, contaminating wells in southeast Morgan Hill, San Martin and a few in north Gilroy. The contamination has been traced to a highway flare manufacturing plant operated by Olin Corporation from 1956 to 1997 on Tennant Avenue in Morgan Hill. Perchlorate affects the function of the thyroid gland (pregnant women and infants are most at risk), and water contaminated with the chemical should be avoided for drinking and cooking. The initial area of plume investigation was bound by Tennant Avenue on the north, Masten Avenue to the south, between Monterey Highway on the west and Center Avenue to the east. At one time, it was believed that the contaminated groundwater flowed only southeast from the site of initial contamination. (Coyote Valley is about two miles to the northwest.) However, more recent information indicates that the chemical can migrate north in some gradients or sections.[14] The perchlorate situation is closely monitored by the District and affected cities. Figure 1-32 shows perchlorate concentrations as of February 2005.

[13] SCVWD Groundwater Management Plan 2001, p 41

[14] Lawrence Livermore National Laboratory, "California Aquifer Susceptibility: A Contamination Vulnerability Assessment for the Santa Clara and San Mateo County Groundwater Basins," 2002, p. 17

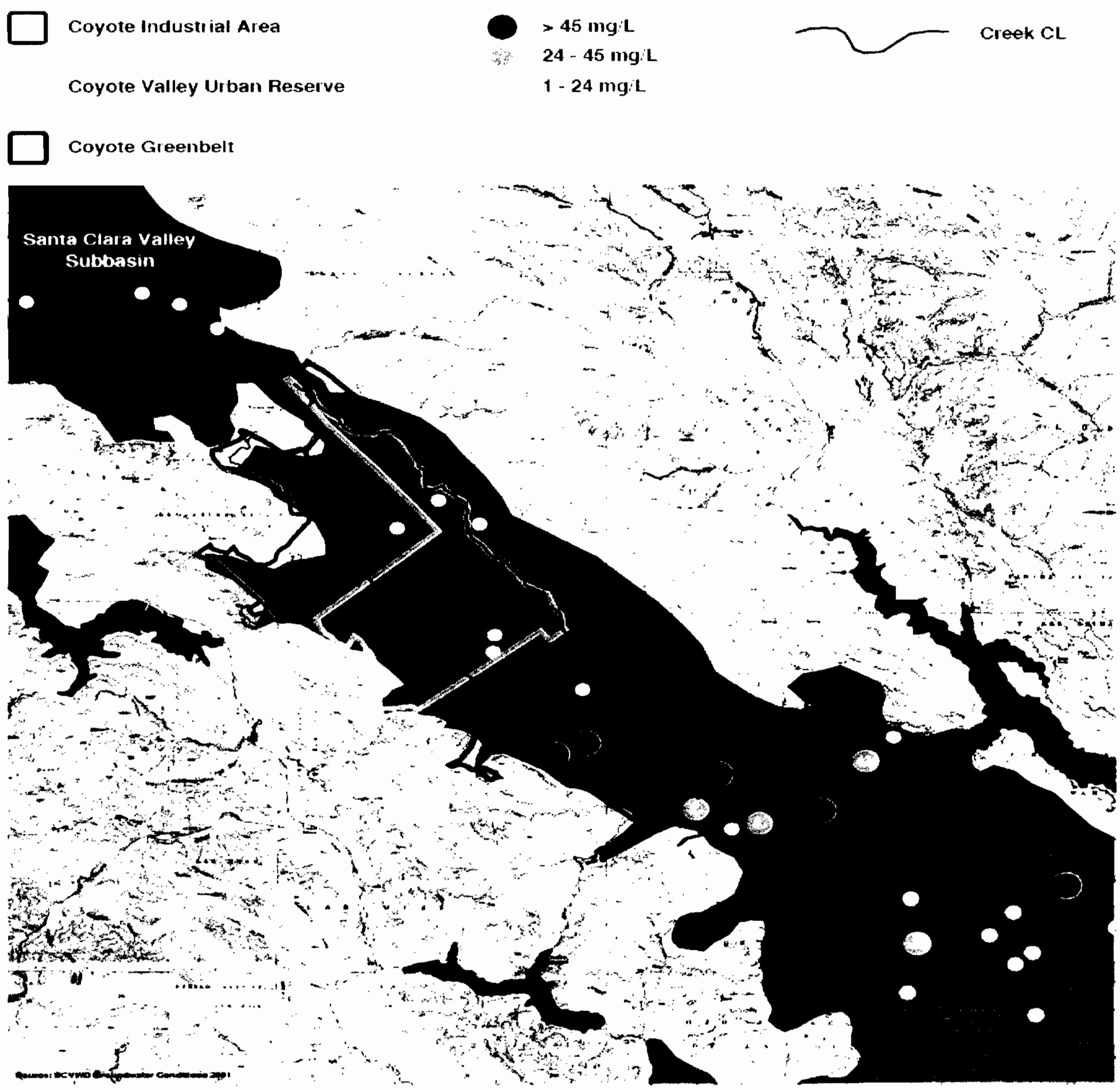

Figure 1-31: Nitrate Concentrations (mg/l as NO_3) in and near Coyote Valley

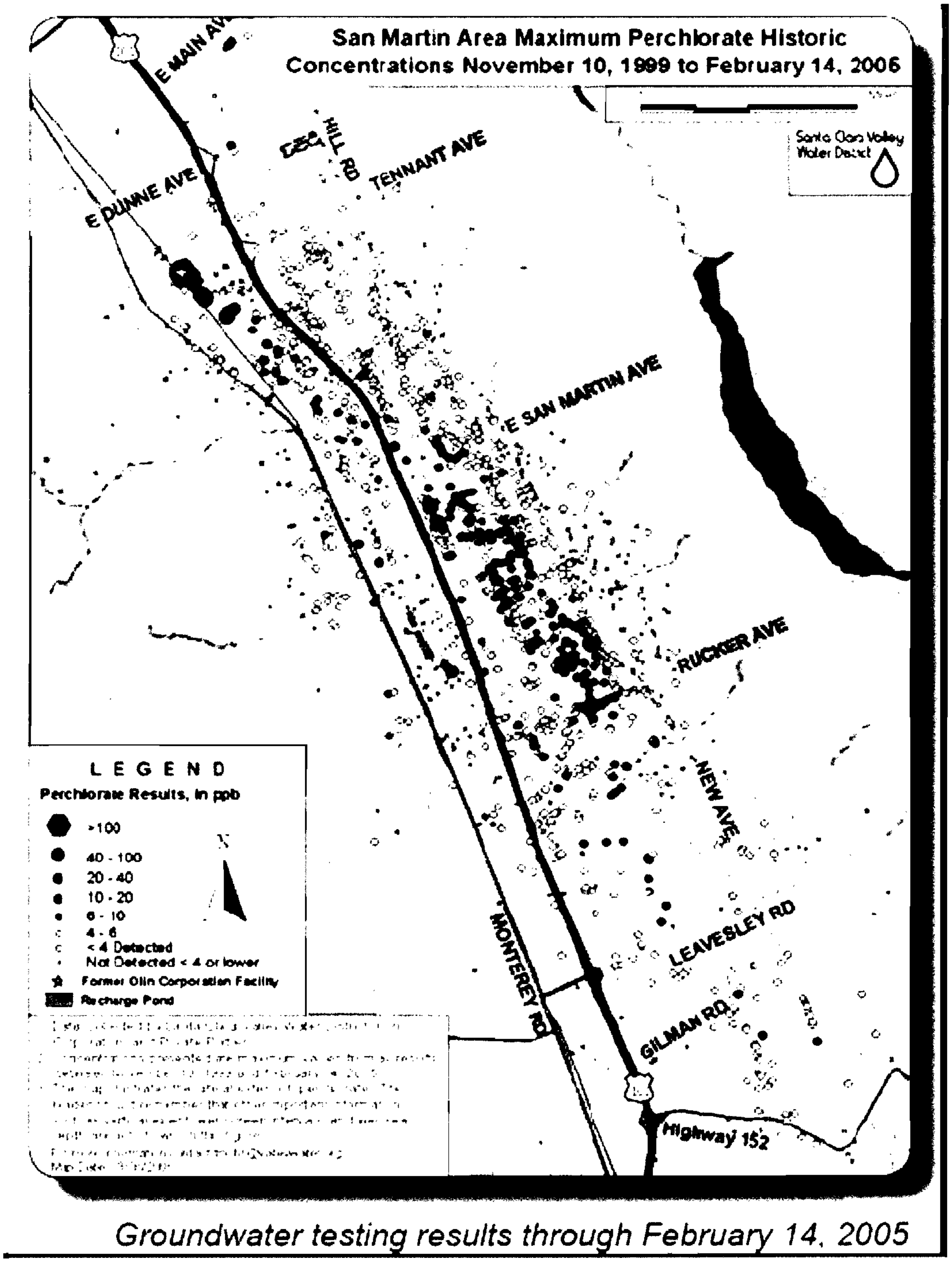

Figure 1-32: Perchlorate Concentrations (ppb) in Llagas Sub-basin[15]

[15] SCVWD, Fact Sheet: "Perchlorate Contamination in the Groundwater of Southern Santa Clara County," April 2005.

CHAPTER 2
PROJECT IMPACTS

After presenting general impacts to the plan area's hydrology from urbanization, this chapter examines specific project impacts to existing water resources conditions in Coyote Valley (presented in Chapter 1) using current planning and regulatory climates to define those impacts. To ensure the health and sustainability of the groundwater basin, it must remain in balance. The first half of this chapter examines how proposed development could upset the basin's equilibrium, and how recent legislation forces government agencies to be proactive in maintaining stable groundwater levels and an adequate water supply of good quality. The latter half of the chapter examines project impacts to storm drainage and potential flooding, where maintaining adequate floodplain storage is a key to adequate mitigation.

2.1 Coyote Valley Specific Plan Project

As stated in the City's *San Jose 2020 General Plan*, planned development within the area is in the form of new town – an integrated community with jobs, housing, commercial facilities, schools, parks, other residential service facilities, infrastructure and public transit. The City's overall vision for urban Coyote Valley is a unique, vibrant, balanced community where people live, work, learn, shop, worship, and play.[1]

2.1.1 *Project Location*

The Coyote Valley Specific Plan (CVSP) project ("Plan Area") area occupies about 7,000 acres of mostly undeveloped and flat land within the Sphere of Influence of the City of San Jose, about 12 miles south of downtown. The Plan Area is bounded by Tulare Hill and south San Jose's Santa Teresa area to the north, US Highway 101 and the Mount Hamilton Range to the east, the City of Morgan Hill to the south, and the Santa Cruz Mountains to the west. Figure 1-2 shows the relationship of Coyote Valley to the greater San Jose area.

2.1.2 *Project Background*

The City's *San Jose 2020 General Plan* currently designates Coyote Valley in terms of three distinct land use designations: the "North Coyote Campus Industrial" area, the "Coyote Valley Urban Reserve" (also known as "Mid-Coyote"), and the "Coyote Valley Greenbelt", which is considered to be a permanent, non-urban buffer between San Jose and Morgan Hill. Figure 2-1 delineates existing General Plan land use designations.

[1] City of San Jose Planning Department, *CVSP Project Description*, October 19, 2005.

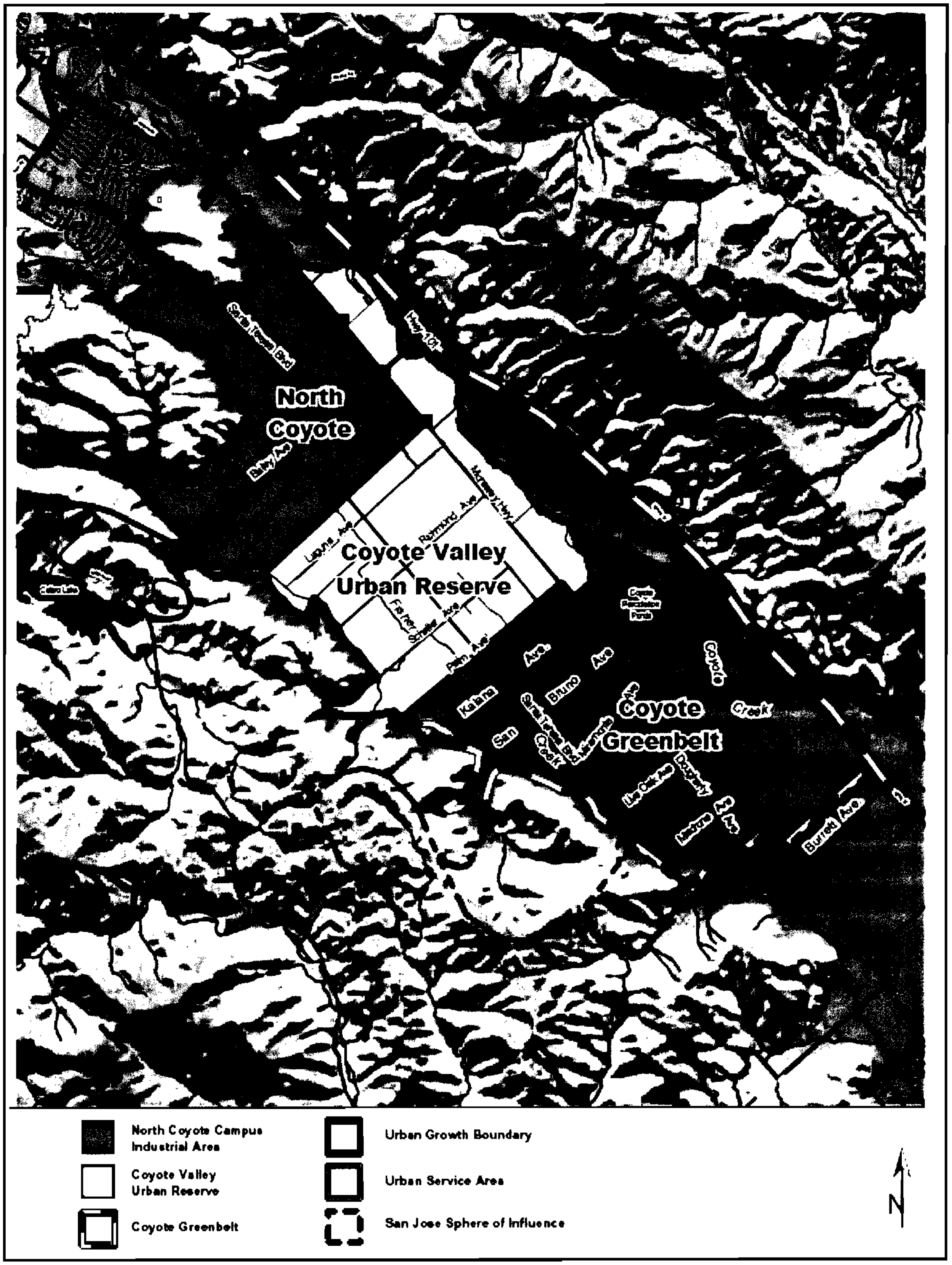

Figure 2-1: General Land Use Designations in Coyote Valley (source: CVSP Project Description)

City planners anticipate that at ultimate build-out 70,000 to 80,000 people will call the Plan Area home. The project is expected to generate at least 50,000 industry-driving and business support jobs, and 5,000 government and retail jobs. Figure 2-2 shows the Plan Area project as presently envisioned in the Coyote Valley Specific Plan (CVSP).

The CVSP would be incorporated into the City's General Plan upon plan adoption. The current "North Coyote Campus Industrial" and "Coyote Valley Urban Reserve" designations would be replaced with a "Coyote Valley Planned Community" designation. Additional General Plan amendments would be proposed to reflect the Greenbelt Strategy.

2.1.3 *Urban Typologies*

As discussed in Section 2.2, changing land uses will have the greatest impact on Coyote Valley hydrology. The CVSP includes land use "typologies" that describe the relative amount of urbanized area and impermeable surfaces expected within the Plan Area. Table 2-1 provides approximate gross acreages for the CVSP project components shown on Figure 2-2.

Table 2-1: Approximate Gross Acreages for CVSP Project Components

Component	**Acreage**	**% of Total Acreage (7,160 ac)**	**% of Developed Acreage (3,539 ac)**
Workplace	389	5	11
Residential	1,135	16	32
Mixed Use	161	2	5
Retail	34	1	1
Public Services (Parks, Schools, etc.)	460	6	13
Infrastructure (Roads, Flood Storage)	1,360	19	38
Developed Area	**3,539**	49	100
Greenbelt	3,621	51	
TOTAL	**7,160**	100	

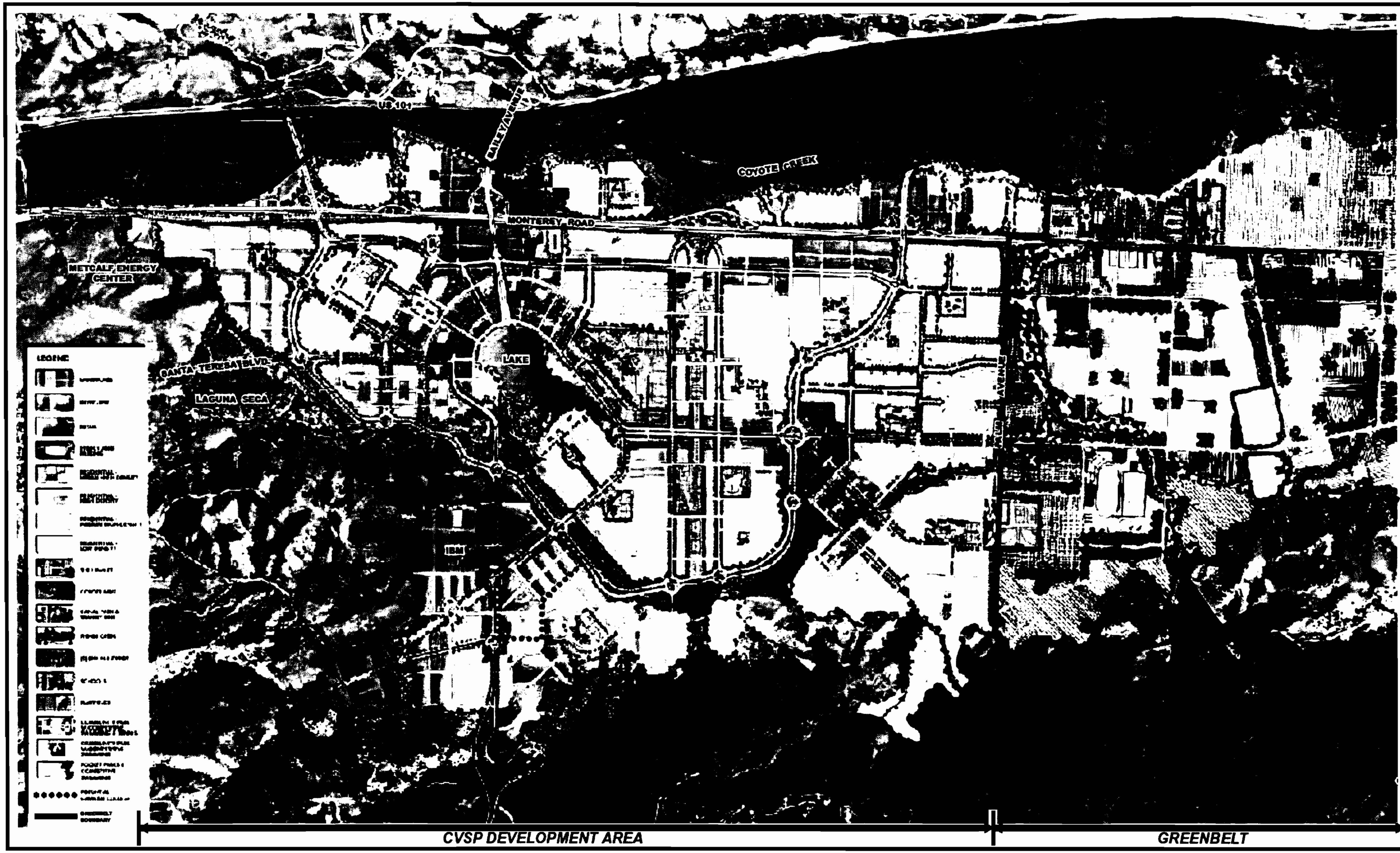

FIGURE 2-2 COYOTE VALLEY SPECIFIC PLAN AREA

The CVSP includes various typologies based on building types and functions. To analyze project impacts, typical site coverage with hardscape and green space is of utmost interest. Table 2-2 details the urban typologies proposed for the Plan Area and lists typical impermeable surface percentages. Green space is defined as landscaped, permeable area. While hardscape areas could include some permeable surfaces such as permeable pavement and/or pavers, the hydrologic impact analyses herein assume that all areas identified as hardscape are one hundred percent impervious. Many of the CVSP topologies are further broken into sub-categories. Table 2-2 lists the sub-categories, but is intended only to categorize urban typologies based on the percentage of impermeable surface.

Table 2-2: Urban Typologies Used to Analyze Hydrologic Impacts

Urban Typology	Included Sub-Categories	% Hardscape (Impermeable)	% Greenspace (Permeable)
Corporate Office	Corporate/Tech Office R&D Lab Downtown Professional Service Office Light Industrial	75	25
Manufacturing	Light Assembly and Manufacturing	93	7
Low Density Residential	Single Family Detached (5 units per acre)	61	39
Medium Density Residential	Single Family Detached (10 -14 units/acre) Townhomes with Private Garages	75	25
Multi-story Residential w/ Structured Parking	High-Rise Mid-Rise Four-Story Framed w/ Structured Parking	75	25
Multi-story Residential w/ Surface Parking	Three-Story Framed w/ Surface Carport Parking	90	10
Mixed Use	Live Work Loft/Townhome High-Rise 3 Floors Office over Commercial 3 Floors Residential over Commercial 3 Floors Residential over Optional Office 2 Floors Residential over Optional Office	75	25
Retail	Local Retail Regional Retail Local and Regional Retail in Mixed Use	90	10
Transportation	Parkways	65	35
Educational	Primary and Secondary Schools	45	55

2.2 General Hydrologic Impacts Due to Urbanization

Land currently vacant, fallow, or in agricultural production will convert to urban uses (residential, commercial, industrial, institutional) as the specific plan area develops. An urban area has the potential to require more water for domestic and municipal demands than a rural area. (This potential, which addressed in detail herein, is not a given.) Urban uses also contain more hardscaped area (building footprints, paving, sidewalks, plazas, etc.) than currently rural areas. These hard surfaces are more impermeable and result in less soil infiltration of rainfall and surface runoff. Moreover, urbanized areas tend to have more developed and efficient drainage systems than rural areas, with storm runoff often conveyed in underground pipes. Storm water runs off more quickly from an urban area than a rural area, all other conditions equal.

Potential hydrologic impacts from urbanization in the development area include:

- Increased water demands;
- Less groundwater recharge;
- Increased storm water runoff; and
- Changes in water quality.

Urbanization could potentially upset the existing hydrologic balance in Coyote Valley. To avoid this impact, the Coyote Valley Specific Plan proposes mitigation by project design. Project elements that provide mitigation by design are introduced in the next section.

2.2.1 *Potential Hydrologic Impact of Urban Typologies*

Land uses shown on Figure 2-2 are used in conjunction with development typologies outlined in Table 2-2 to analyze potential hydrologic impacts. The existing conditions hydrology model described in Section 1.2.3.1 has been modified to reflect increased impervious surfaces within the Development Area assuming that natural floodplain attenuation is eliminated. Table 2-3 presents the results of this analysis for 100-year conditions (10-year conditions would see a proportionally similar change), and Figure 2-3 shows the change in the 24-hour, 100-year discharge hydrograph to Coyote Creek. The potential impact is very significant and would require a substantial increase in Fisher Creek capacity to avoid flooding. Therefore, the proposed CVSP project is designed to include drainage and flood control systems that preserve effective floodplain storage within Coyote Valley. Impacts of the proposed project as described in this chapter have been determined assuming that the described flood control system is constructed as part of the project.

Table 2-3: Potential Impact to Fisher Creek Discharge

Location	100-year Discharge (cfs)	
	Existing	Developed
Palm Avenue	1,410	1,410
Bailey Avenue	2,610	3,060
Santa Teresa Boulevard	1,430	3,970
Coyote Creek	1,530	4,120

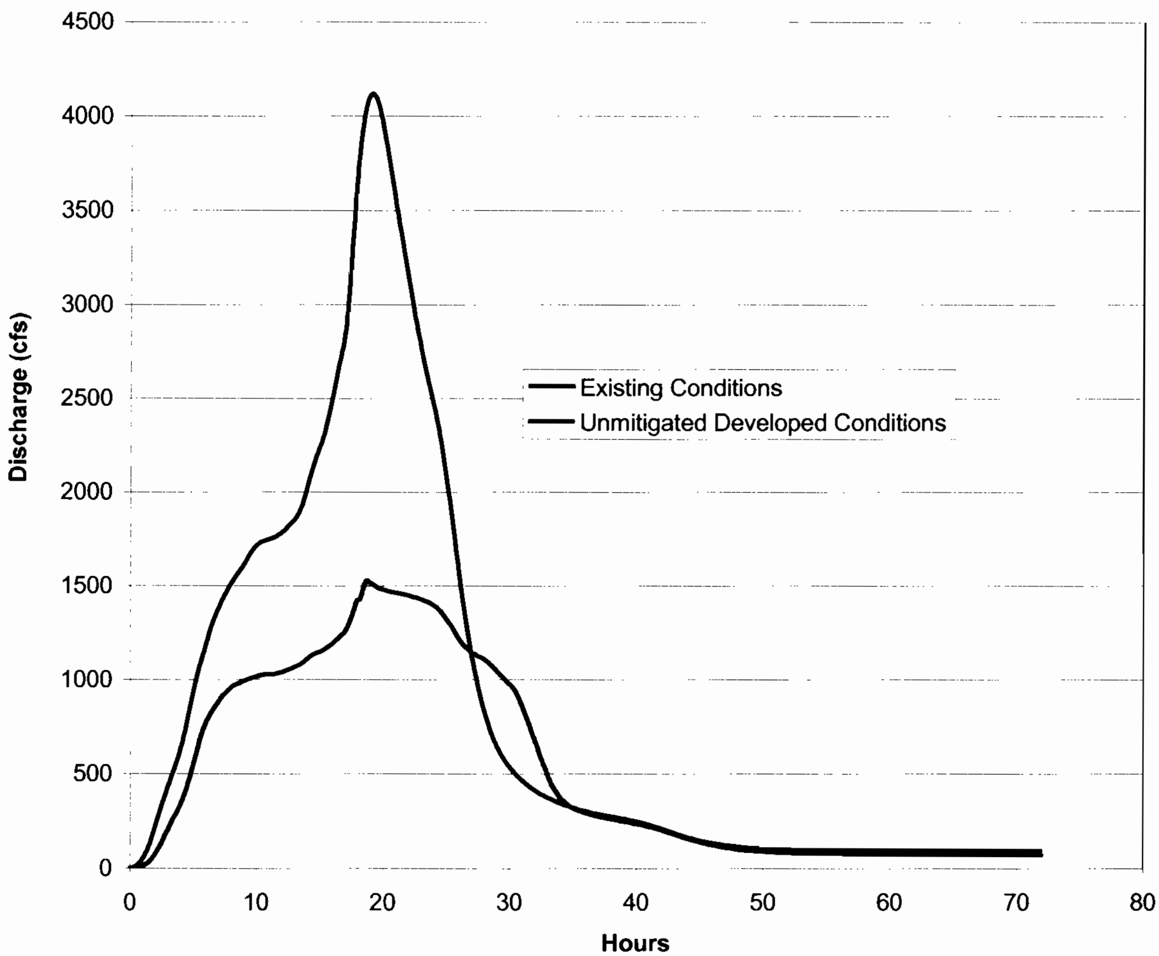

Figure 2-3: Fisher Creek Discharge at Coyote Creek Confluence

2.3 Proposed Drainage and Flood Control Systems

Proposed CVSP drainage and flood protection elements are illustrated by Figure 2-4 and described in subsequent paragraphs. The intent of the drainage and flood control systems is to preserve effective floodplain storage within Coyote Valley so that areas downstream in the Coyote Creek watershed are not adversely impacted during major storm runoff events. Since the Plan Area is, in essence, a completely new town, storm drain and flood protection systems can be designed to mitigate impacts not only within the Plan Area, but impacts to downstream areas.

The system shown on Figure 2-4 is designed to protect the Plan Area from inundation during a 100-year storm runoff event, without exacerbating flood conditions elsewhere in the Coyote Creek watershed. Designed flood protection improvements previously approved as part of the Coyote Valley Research Park (CVRP) project that will be constructed between 2006 and 2008 for the area north of Bailey Avenue are assumed to be part of the proposed flood protection project for the Plan Area.

2.3.1 Fisher Creek Restoration. Section 1.2.1.2 describes the existing condition of Fisher Creek and its historic conversion from a natural alluvial stream feeding Laguna Seca into a reclamation ditch intended on improving agricultural drainage. Restoring the Plan Area segment of Fisher Creek to a more natural state (Figure 2-5) following its historic alignment (Figure 2-6) is one key component of the proposed CVSP drainage and flood protection system.

Channel widening and riparian enhancements along the banks characterize proposed restoration efforts within Segment 1 (Figure 2-4) between Fisher Creek's confluence with Coyote Creek and a point roughly 3,600 feet upstream (1,400 feet east of Santa Teresa Boulevard). Segment 1 work includes channel widening and enhanced riparian habitat along the banks. Open water sections of the channel would be maintained to ensure conveyance of flood flows, with the riparian areas providing flood storage attenuation in addition to wildlife habitat. At the upstream limit of Segment 1, a previously permitted 72-inch inch diameter drainage outfall would be constructed to drain the adjacent detention basin (subsequently described). This control structure creates and regulates a second detention basin with a widened Fisher Creek adjacent to it.

Segment 2 describes the reach of restored creek between Segment 1 and Bailey Avenue. The channel design from Santa Teresa Boulevard to Bailey Avenue has been approved and permitted as part of the Coyote Valley Research Park. This design both widens the channel and utilizes Laguna Seca for flood storage. Construction of this reach began in 2006.

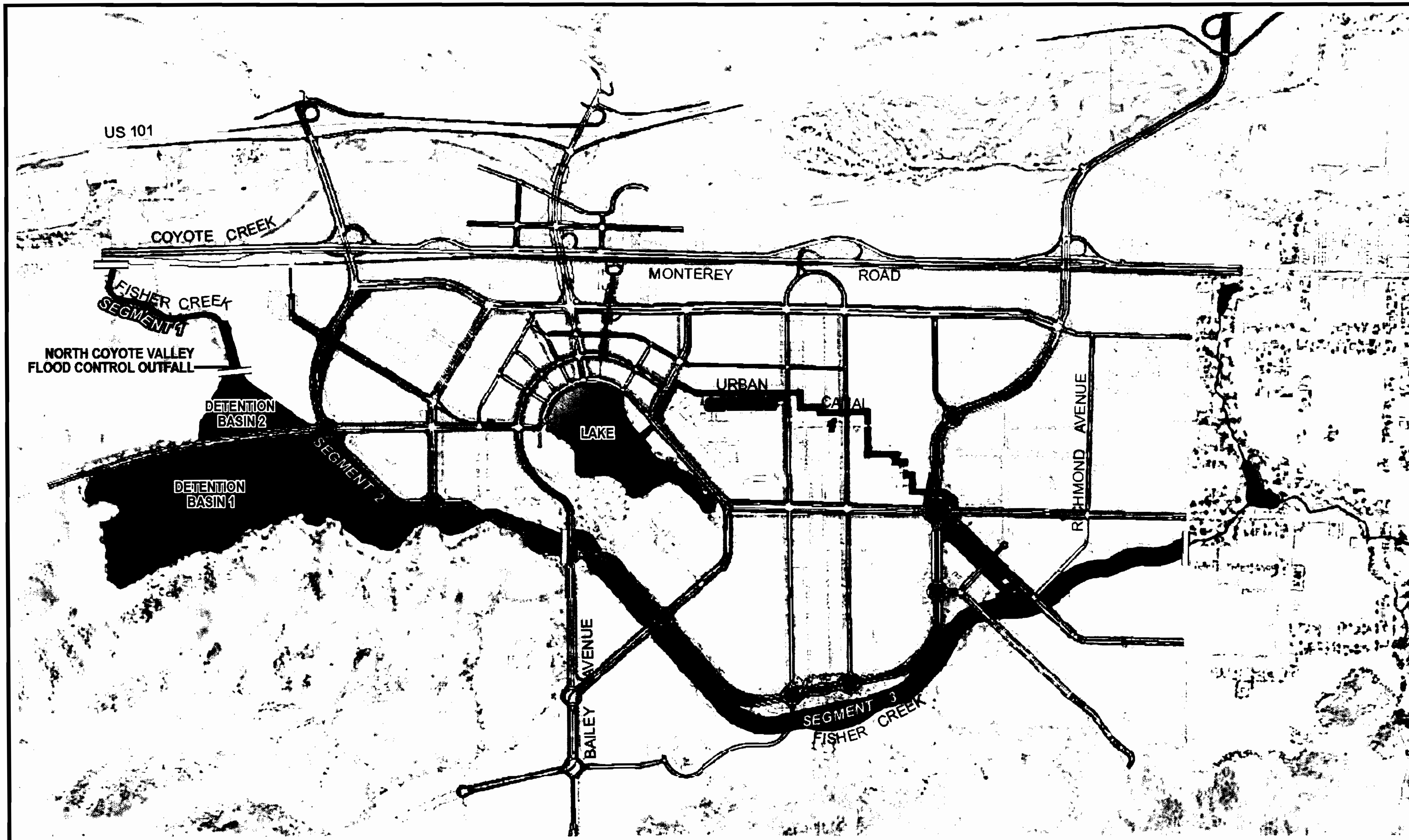

FIGURE 2-4 PROPOSED DRAINAGE AND FLOOD PROTECTION SYSTEM FOR CVSP

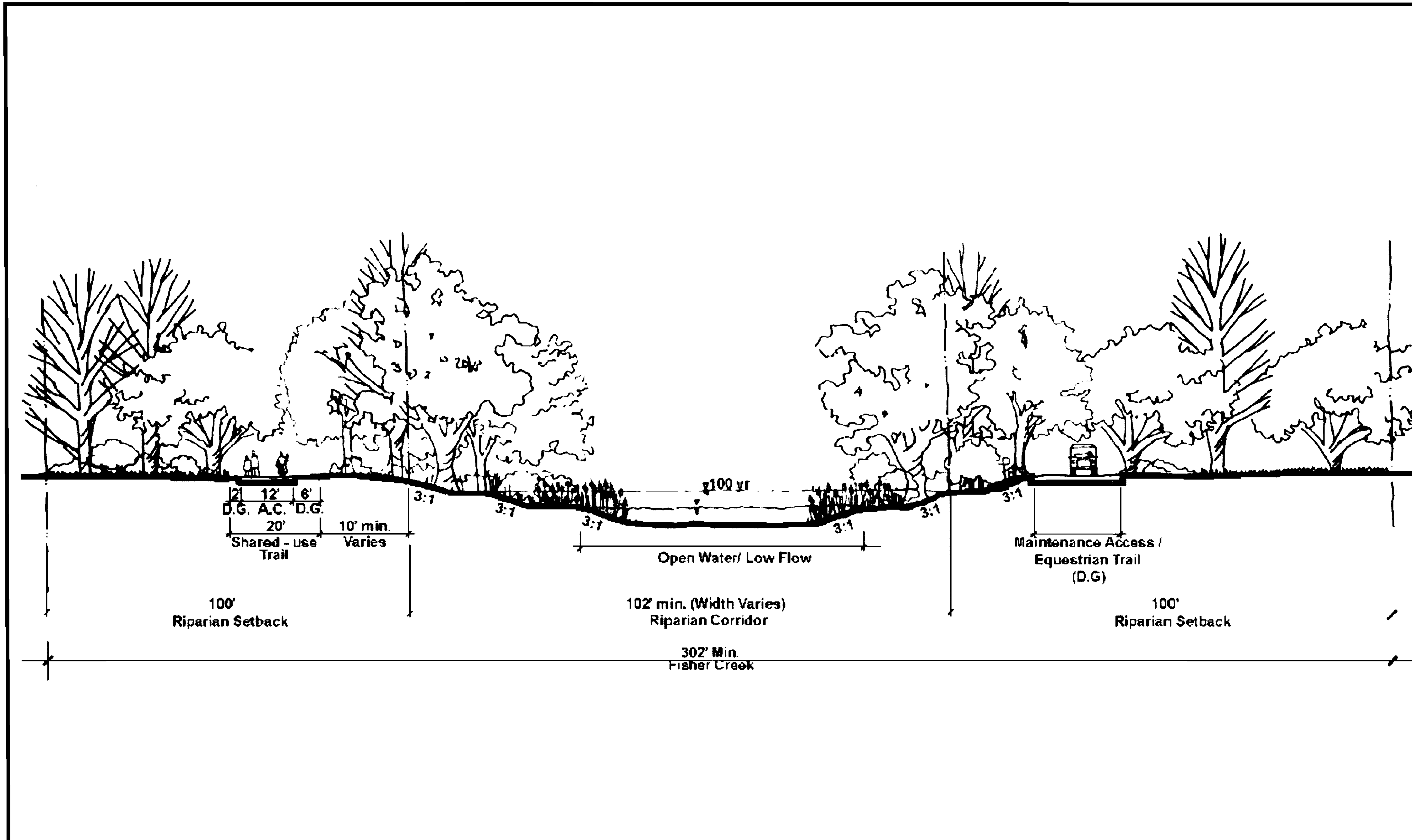

FIGURE 2-5 **GENERALIZED CROSS-SECTION OF FISHER CREEK RESTORATION**

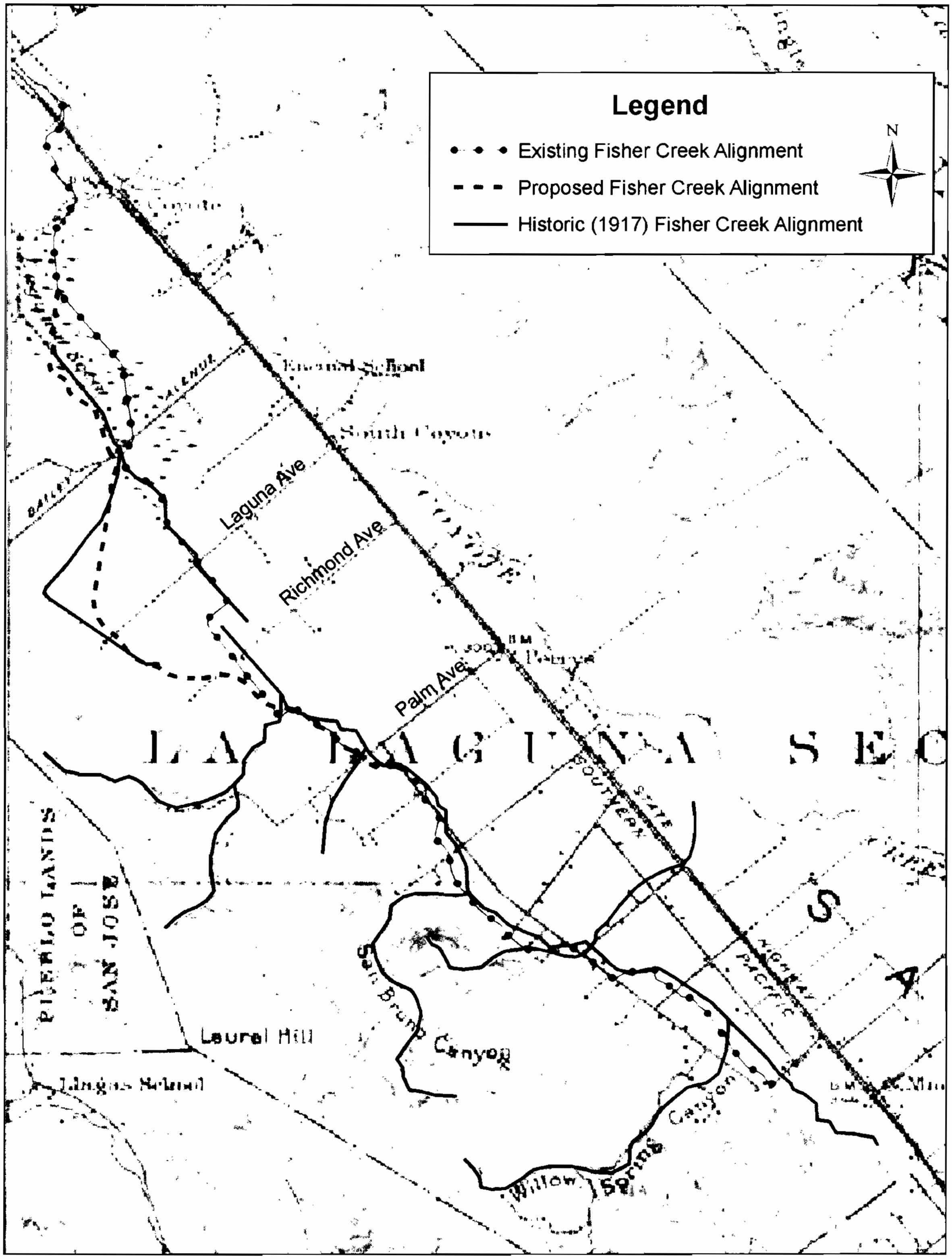

Figure 2-6: Proposed Alignment of Fisher Creek Restoration

The existing reclamation ditch between Santa Teresa Boulevard and Bailey Avenue will be filled and abandoned, so that the restored Segment 2 channel may flow within a more historically natural alignment along the base of the western hills (Figure 2-6). This alignment will also maximize the potential for Fisher Creek to remain wet north of Bailey Avenue throughout the year. The restored channel will be relocated within a lower topographic area closer to the groundwater table compared to the current alignment of Fisher Creek, which is perched above its westerly drainage. As an added benefit, the restored alignment of Fisher Creek eliminates the need for artificial flood protection levees.

Upstream of Bailey Avenue south to Palm Avenue (Segment 3), the existing reclamation ditch will be filled and abandoned so that Fisher Creek may be returned closer to its historic alignment at the base of the hills within the lowest elevations of the valley. The restored creek would be a multi-stage channel, eight to ten feet deep, with a low flow channel creek within a wide floodplain, designed to allow for low flow channel migration within the floodplain and provide connectivity between the low flow channel and active floodplain such that during larger storm events, sediment will be deposited on the floodplain. The new riparian/floodplain corridor will be at least 300 feet wide, with 100-foot riparian setbacks on each side of a 100-foot wide floodplain (Figure 2-5). The floodplain will allow for both increased riparian habitat and beneficial human usage such as a trail system. Aggressive landscaping of channel benches with native, appropriate species at the appropriate season would ensure maximum root growth and plant establishment for erosion protection. The low flow channel would be designed so that velocities are generally such to allow for the development of an armor layer during a two-year flow event, and the channel bedding would be sized to allow for natural pool and riffle sequences with the development of natural bars and shoals within Fisher Creek. The corridor will contain the design 100-year base flood discharge without the need for artificial levees or floodwalls.

Above Richmond Avenue, Fisher Creek would be enhanced within its current alignment (matching its historic alignment) to contain the base flood discharge within a newly established riparian corridor. Segments of Fisher Creek within the Greenbelt will remain in their existing configuration and will be the focus of analyses for in-stream groundwater recharge alternatives for Coyote Valley.

2.3.2 Laguna Seca Detention. Two interconnected detention basins would be constructed at the north end of Coyote Valley within the historic Laguna Seca (Figure 2-4). Storage within the detention basins will total 1,700 acre-feet and maintain floodplain storage within Coyote Valley. The larger of the two basins will receive storm runoff overflows from Fisher Creek (roughly in excess of the ten-year return period), store that water and discharge through an existing eight-foot by four-foot box culvert underneath Santa Teresa Boulevard to the second basin, which discharges back to Fisher Creek through the 72-inch diameter outfall. The system is designed for passive operation to limit downstream discharges, but may also be manually operated during individual storms via a system of gates.

2.3.3 Storm Drain Systems. Within the newly urbanized Plan Area, storm drainage infrastructure will be constructed to drain developed areas by gravity into restored Fisher Creek, either directly or through the urban canal and Coyote Lake. Where practicable, the storm drainage system will utilize "green" collection, conveyance and storage facilities in lieu of more traditional underground pipe systems. The green systems are intended to also perform bio-filtration treatment of storm runoff prior to its discharge into receiving waters such as Fisher or Coyote Creeks and ultimately San Francisco Bay. Bio-swales have been designed into the roadway system to capture and trap pollutants from paved urban areas before the storm water can enter the storm drain system. Private developments will be required to construct grassy swales or other features to reduce the transport of pollutants into the public storm system. (See also Section 3.5, "Best Management Practices to Minimize Additional Sources of Pollution.")

2.3.4 Urban Canal. Designed as a unifying theme for the new community, the proposed urban canal is also intended to improve the quality of urban runoff. Figure 2-7 shows a typical cross-section for the feature, which will be excavated between Fisher Creek and Coyote Lake (Figure 2-4).

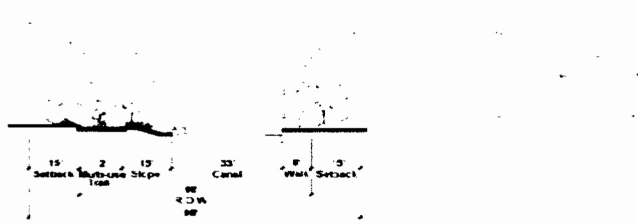

Figure 2-7: Typical Urban Canal Cross Section

The urban canal would be about 10,000 feet (1.9 miles) long and include a shallow channel with both soft and hard edges. In addition to aesthetic and recreational benefits, the canal can provide hydrologic and water quality benefits by conveying urban drainage while providing for lake circulation and aeration.

During dry months water from Coyote Lake would be pumped to and released from the upper end of the canal to provide a daily flow in the canal. During wet months the canal corridor would convey storm water runoff (100-year capacity) from urbanized areas into Coyote Lake. The urban canal will also provide water quality treatment and hydromodification functions through such planned features as a parallel linear park, weirs, and drop structures to create elevation changes for small waterfalls.

Segment 1 of the urban canal (Figure 2-4) runs from a high point at the parkway toward Coyote Lake. Lake water will be pumped up to this high point, aerated in the canal and returned to the lake for improved circulation. Most of this segment will be within an urban environment with hard edges, gradual slopes and straight segments. A series of drops and right angle turns through weirs and drop structures is proposed. Near the lake, the canal will transition to a more natural waterway with minimal slope. The canal's discharge will thus be treated in this last reach before reaching the lake.

The second segment of canal also begins at the parkway high point, but drains in the opposite direction toward a confluence with the relocated Fisher Creek. This shorter reach will consist of more formal urban sections and softer natural sections, emptying into a pool feature at the creek.

2.3.5 Coyote Lake. A central focal lake would be excavated near the present intersection of Santa Teresa Boulevard with Bailey Avenue. The 50-acre feature provides flood storage, runoff treatment (in conjunction with the urban canal), irrigation water storage, and a visual open space focal point within Coyote Valley. Lake water levels would be controlled by a system of outfall pipes and spillways, discharging to Fisher Creek through some combination of storm drains and street flow. Fisher Creek would not be allowed to flow back into the lake. Coyote Lake is proposed to contain 1,400 acre-feet of water during the dry season (normal level) with an additional 250 acre-feet of flood attenuation available during a 100-year storm event. The maximum depth would be 30 feet, with an average overall depth of 15 feet.

Coyote Lake would be lined and separated from local groundwater, functioning as a retention basin that traps and settles residual urban pollutants carried by storm water runoff to improve the relative quality of urban runoff to Fisher Creek. Urban, park, and natural shorelines would front the lake. Additional runoff treatment and floodplain storage would be provided within the park and natural areas adjacent to the lake.

2.3.6 Coyote Creek. Proposed land uses show a 100 foot wide riparian corridor setback between the bank of Coyote Creek and proposed development east of Monterey Road. Development within the creeks 100-year floodplain would be placed on fill meeting NFIP and City of San Jose criteria. This fill would be engineered fill compacted in accordance with FEMA regulations (generally 95 percent relative compaction), but would not be considered as an artificial levee requiring three feet of freeboard. Because Coyote Creek is a perched channel, however, some measure of freeboard (one or two feet) would be provided above the 100-year water surface.

2.4 Specific Plan Impacts to Hydrology

A hydrology or water quality impact is considered significant if the plan would:

- Violate any water quality standards or waste discharge requirements;
- Degrade or deplete groundwater resources or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table;
- Alter existing drainage patterns, including streams and rivers, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding inside or outside of the plan area;
- Alter existing drainage patterns, including streams and rivers in a manner that would result in significant erosion inside or outside of the plan area;
- Provide substantial additional sources of polluted runoff or otherwise substantially degrade surface or groundwater quality;
- Place structures within a 100-year flood hazard area that impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam; or
- Expose people or structures to inundation by seiche, tsunami, or mudflow.

Each of these potential hydrology impacts is investigated below, and if appropriate, mitigation is proposed in Chapter 3.

2.4.1 *Water Quality Standards*

A hydrology and water quality impact is considered significant if the plan would violate any water quality standards or waste discharge requirements.

Development within the Plan Area is subject to the ordinances and policies of the City of San Jose, Santa Clara County and the United States, and specific permit conditions. These ordinances, policies and conditions set forth water quality standards and conditions for the discharge of waste in compliance with the City's National Pollutant Discharge Elimination System (NPDES) permit as overseen by the San Francisco Regional Water Quality Control Board. According to the City of San Jose:[2]

> "The Federal Clean Water Act (CWA) requires local municipalities to implement measures to control pollution from their municipal separate storm sewer systems (MS4) to the maximum extent practicable. In addition, the State of California's Porter-Cologne Water Quality Control Act of 1969 and other State legislation require municipalities to protect water quality.
>
> "Under the auspices of the Clean Water Act and other Federal and State legislation, since 1990 the San Francisco Regional Water Quality Control Board (RWQCB) has issued and reissued an area-wide National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (NPDES MS4 permit) to the City of San José and 14 other co-permittees that have land area which drains to South San Francisco Bay. The other co-permittees include the County of Santa Clara, the Santa Clara Valley Water District, and 12 other municipalities in the county, excluding the cities of Gilroy and Morgan Hill. Together, these jurisdictions constitute the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).
>
> "The intent of these various laws, policies, and guidelines is to mitigate the potentially detrimental effects of urban runoff through proper site design and source control early in the development review process and to provide guidance in the selection of appropriate Best Management Practices (BMPs). BMPs are defined as methods, activities, maintenance procedures, or other management practices for reducing the amount of pollution entering a water body. The City of San José Department of Planning, Building and Code Enforcement (PBCE) reviews individual development projects for conformance with applicable laws, policies, and guidelines, including the NPDES Permit requirements."

Plan Area development must conform to all promulgated water quality standards and waste discharge requirements, so this impact is less than significant.

2.4.2 *Degradation of Groundwater Resources*

A hydrology and water quality impact is considered significant if the plan would degrade or deplete groundwater resources or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table.

[2] City of San Jose Department of Planning, Building and Code Enforcement.

Proposed development within the Plan Area requires an adequate supply of high quality municipal water for domestic, commercial and industrial use. As parts of the valley north of the Urban Reserve Line convert from agricultural use to urban use, water demands are likely to increase. Increased volumes of water, therefore, could be extracted from the Coyote Valley Groundwater Sub-basin.

2.4.2.1 Increased Water Demands in Coyote Valley. Table 1-3 shows that valley-wide pumping within the groundwater basin currently totals about 8,000 acre-feet per year. A majority of the current groundwater extractions are for agricultural uses. Aerial photographs indicate that about 7,400 acres within Coyote Valley are irrigable. (This acreage is primarily on the valley floor below the 15 percent slope line.) The unit value of applied water in Coyote Valley is therefore about 1.1 acre-feet per year per acre. In terms of agricultural production, Coyote Valley may currently be underutilized based on unit values for irrigation water typical to South Santa Clara Valley, which range to roughly 4 acre-feet per year per acre.[3] Existing aggregate water demands, including demands for recycled water, within the Coyote Groundwater Basin total 11,000 acre-feet per year.[4] The Water Supply Analysis (WSA) referenced herein forecasts ultimate water demands in Coyote Valley based on proposed land uses, housing, population, and other data from the CVSP. Ultimate demands are summarized by Table 2-4.

Table 2-4: Forecast Water Demand in Coyote Valley

	Ultimate Water Demand (acre-feet per year)		
Land Use	**Potable**	**Recycled**	**Total**
CVSP Area			
Residential	6,400	1,200	7,600
Workplace	1,700	300	2,000
Commercial/Retail	100	100	200
Public Facilities	1,700	400	2,100
Subtotal, CVSP	**9,900**	**2,000**	**11,900**
Greenbelt Area			
Greenbelt Strategy Area	2,000	1,000	3,000
Other areas	100	900	1,000
Outside Plan Area	1,600	400	2,000
Metcalf Energy Center	600	4,000	4,600
Total	**14,200**	**8,300**	**22,500**

[3] California Department of Water Resources, 1981.
[4] City of San Jose, *Coyote Valley Specific Plan Water Supply Assessment*, October 2006.

Total water demand within Coyote Valley may essentially double from 11,000 acre-feet per year to 22,500 acre-feet per year. Furthermore ultimate potable water demands are expected to increase from roughly 8,000 acre-feet per year to 14,200 acre-feet per year. Currently 4,000 acre-feet per year of non-potable water to Metcalf Energy Center are supplied by the South Bay Water Recycling Program's Silver Creek Pipeline.

2.4.2.2 Changes to Natural Groundwater Recharge. As discussed in Chapter 1, the majority of basin recharge (85%) is from surface waters flowing in Coyote Creek. Plan Area development will not affect this recharge. The remaining 15 percent of natural recharge is from the percolation of irrigation water, septic sewage, and direct precipitation. Development within the Plan Area will impact this remaining recharge due to an increase in impermeable surfaces (which reduces the surface area available to percolate surface water), the elimination of septic systems north of the Urban Service Limit, and a reduction in irrigated acreage.

Reduction of Permeable Surface Area

Coyote Valley is bounded by mountain ranges to the west and east. Available soil mapping suggests that within the higher elevations, soil permeability is relatively low (Figure 1-15). Soils high in clay content and low in permeability also characterize the valley floor north of Bailey Avenue. Therefore, most of the natural groundwater recharge to the west of Coyote Creek probably occurs within the valley floor south of Bailey Avenue. Based on the CVSP *Project Description*, most groundwater recharge probably takes place over about 5,700 acres in the Urban Reserve and Greenbelt areas. Measurements taken from aerial photographs suggest that of that land, roughly 5 percent could be considered impermeable to water percolation (roads, parking lots, greenhouses, and other buildings). After the Plan Area is built out, the percentage of impermeable surface would increase to about 30 percent south of Bailey Avenue. The decrease in groundwater recharge from direct precipitation therefore might be on the order of 25 percent of 1,700 acre-feet per year (Figure 1-16) or 425 acre-feet per year.

Reduction in Irrigation Return

Irrigation return water is estimated to provide 700 acre-feet of recharge to the Coyote basin in an average year (Figure 1-16). This represents a return "efficiency" of approximately ten percent. (That is, ten percent of applied irrigation water reaches the groundwater table through soil percolation.) Assuming a similar efficiency after Plan development and a rough split of applied irrigation water proportional to acreage, about 40 percent of irrigation recharge (280 afy) occurs within the Development Area while the remaining 60 percent of recharge (420 afy) takes place within the

Greenbelt. Table 2-4 forecasts an ultimate non-potable water demand of 1,500 for school, park, median, and bioswale irrigation. About 60 percent of potential irrigation acreage within the development area is located south of Bailey Avenue above relatively permeable soils. Assuming a return efficiency of ten percent, total ultimate groundwater recharge is estimated to be about 500 afy, which represents a 30 percent reduction in this category of natural recharge.

Reduction in Septic Leachfield Percolation

Percolation from septic leach fields contributes about 800 acre-feet of recharge to the groundwater basin on an average annual basis (Figure 1-16). Proportioning based on land use, soil type, and acreage, about 480 acre-feet of this recharge occurs within the Greenbelt. The remaining 320 acre-feet of leach field recharge would be eliminated in the Development Area when sanitary wastes are routed to the Outvalley Sewer. In sum, the project is expected to reduce natural groundwater recharge by roughly 1,000 acre-feet per year (from 3,200 afy to 2,200 afy), which represents about five percent of all current estimated recharge (20,000 acre-feet per year) in an average year.

2.4.2.3 Changes to Groundwater Levels. As described in Chapter 1, groundwater levels respond to changes in the balance between groundwater recharge and withdrawal. Extracting an additional 5,700 acre-feet of water from the Coyote Valley Sub-basin, and reducing natural recharge by 1,000 acre-feet every year would reduce the amount of water stored in the basin and lower the water table, unless artificial recharge to the basin is commensurately increased. Without additional recharge, the Coyote Basin can only provide for three to five years of the increased demand after ultimate development, since the aquifer's operational storage is thought to range from 23,000 acre-feet to 33,000 acre-feet.[5]

In the absence of proactive groundwater basin management, the water budget in Coyote Valley would adjust in response to the increase in groundwater extractions. Additional surface water recharge could possibly be induced by falling groundwater levels, although based on conversations with Santa Clara Valley Water District staff, there does not appear to be a direct correlation between recharge capacity and groundwater contours in the valley. Since the ability to recharge the groundwater basin from (primarily) Coyote Creek is related far more strongly to the annual amount of water flowing in the creek, the discharge components of the groundwater budget would change more than the recharge components.

[5] SCVWD, "Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins," April 2002.

With declining groundwater elevations in Coyote Valley, subsurface flow through Coyote Narrows to the northern Santa Clara Valley Sub-basin would likely decrease. Natural discharge to Fisher Creek would also decrease, perhaps precipitously. Many phreatophytes and crops within the shallow "perched" groundwater areas north of Bailey Avenue rely upon a base flow in Fisher Creek, which might be significantly constrained by lower groundwater levels between Palm Avenue and Laguna Avenue, where Fisher Creek is believed to be fed during the dry season.

Ultimately the remaining groundwater budget would be balanced by stored water, leading to a significant reduction in groundwater elevations throughout the valley. This is not a sustainable condition and the potential impact requires mitigation as described in Section 3.1.2 of this report.

2.4.3 *Induced Flooding Inside or Outside of Plan Area*

> A hydrology and water quality impact is considered significant if the plan would alter existing drainage patterns, including streams and rivers, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding inside or outside of the plan area.

Development in or near a natural floodplain has the potential to change that floodplain and affect flooding further downstream. The conversion of rural watersheds to more urban uses tends to increase the percentage of impermeable ground cover, with commensurate increases in maximum watershed discharge rates and volumes. In terms of an analysis of potential induced flooding, the one-percent event (100-year return period) is the national standard for protection.

Schaaf & Wheeler previously studied Coyote Valley flooding for Coyote Valley Research Park, LLC (CVRP). Based on the planned flood control improvements for CVRP, FEMA issued a Conditional Letter of Map Revision (CLOMR) in May 2001. Since FEMA has already approved floodplain mitigation plans in North Coyote, the approved hydrology models are used and modified as necessary to identify project impacts to Fisher and Coyote Creeks within the Plan Area and downstream to San Francisco Bay.

2.4.3.1 Altering Drainage Patterns. As discussed in this chapter, previously disturbed sections of Fisher Creek will be eliminated in favor of a return to the creek's historic natural watercourse through lower elevations of Coyote Valley adjacent to the Santa Teresa Hills. The project would restore natural drainage patterns in the Development Area. Altering the current drainage pattern (with a perched Fisher Creek unnaturally confined by levees through much of the Development Area) is considered to be a beneficial hydrologic impact.

Runoff from the western hills and valley floor would be conveyed through natural creek and riparian corridors toward Laguna Seca for flood relief prior to Coyote Creek discharge, more closely mimicking historic drainage patterns as depicted in Figure 2-6.

2.4.3.2 Flooding Within the Plan Area. The proposed plan described in this chapter is designed to preserve existing flood control storage in the Fisher Creek floodplain; correct existing flooding problems in the Development Area; accommodate additional runoff generated from newly urbanized areas; and restore Fisher Creek. The plan preserves Fisher Creek downstream of Santa Teresa Boulevard to Coyote Creek, the Fisher Creek bridges at Monterey Highway and the UPRR, and Coyote Creek. One percent (100-year) flood flows would be safely contained within each segment of the restored Fisher Creek, the Urban Canal, Coyote Lake, and the northern detention basins, including Laguna Seca.

The FEMA-approved model described above has been modified to reflect the hydrologic impact from the Development Area assuming a design 24-hour storm event and including runoff from tributary watersheds outside the Plan Area (e.g. Morgan Hill). Table 2-5 summarizes new design discharges at selected locations within the Development Area.

Table 2-5: Fisher Creek Design Discharges

	Design Discharge (cfs)	
Location	**10-year**	**100-year**
Palm Avenue	820	1,430
Palm Canyon	1,210	2,020
Bailey Avenue	1,620	2,890
Santa Teresa Boulevard	960	1,250
Monterey Road / SPRR	1,220	1,540
Coyote Creek (incl. E. of Monterey)	1,420	1,830
Maximum Stage (feet)		
Coyote Lake	248.5	249.6
Laguna Seca	243.5	250.0

Fisher Creek extends from Bailey Avenue to Santa Teresa Boulevard along the southern end of the Laguna Seca flood control storage area (Segment 1, Figure 2-4). Flows in excess of the creek channel capacity would overflow into the Laguna Seca storage area, thereby controlling the flow in Fisher Creek below Santa Teresa during peak runoff periods. Water stored within Laguna Seca would be metered back into Fisher Creek through a culvert restriction at Santa Teresa Boulevard.

The existing Fisher Creek channel north of Bailey Avenue will remain in place to avoid impacts to wetlands and the riparian corridor. No major modifications to the existing Fisher Creek channel are proposed, and a 100-foot setback from the riparian corridor will be maintained. Between the Urban Reserve boundary and Bailey Avenue, the relocated and enhanced Fisher Creek (Figure 2-4) would provide capacity for discharges due to specific plan implementation and limit the floodplain boundaries to its riparian corridor.

Berms and levees required to implement the Laguna Seca overflow and storage concept will be constructed to meet engineering and seismic requirements with three feet of freeboard over the 100-year water surface elevation as required by FEMA. Areas suitable for building within the Development Area would be removed from the mapped Special Flood Hazard area by elevating the surrounding grade above the design 100-year water level in Fisher Creek and Laguna Seca. Similarly, areas suitable for building in the Development Area between Monterey Road and Coyote Creek would be elevated above the 100-year water surface profile in Coyote Creek's floodplain to meet NFIP and City development criteria.

With Fisher Creek flood flows confined to the creek's riparian corridor and Laguna Seca, and development within Coyote Creek's western floodplain safely elevated above the 100-year water surface, CVSP development as proposed would not result in flooding within the Plan Area.

2.4.3.3 Flooding Outside the Plan Area. Hydrologic modeling prepared for the original City of San Jose Flood Insurance Study (1982) has been modified to include updated work for the Fisher Creek watershed, under both existing and post-development conditions. To be consistent with established hydrology for Coyote Creek, a 72-hour 100-year design storm is simulated. Figure 2-8 presents 72-hour, 100-year discharge hydrographs for Coyote Creek immediately downstream of the Fisher Creek confluence with and without CVSP, assuming the FIS condition of Anderson Reservoir antecedent storage (81,000 acre-feet).

Because Coyote Creek's drainage area dominates Fisher Creek's, and adequate floodplain storage is maintained in Fisher Creek and Laguna Seca, there is very little impact to Coyote Creek's downstream 100-year hydrograph.

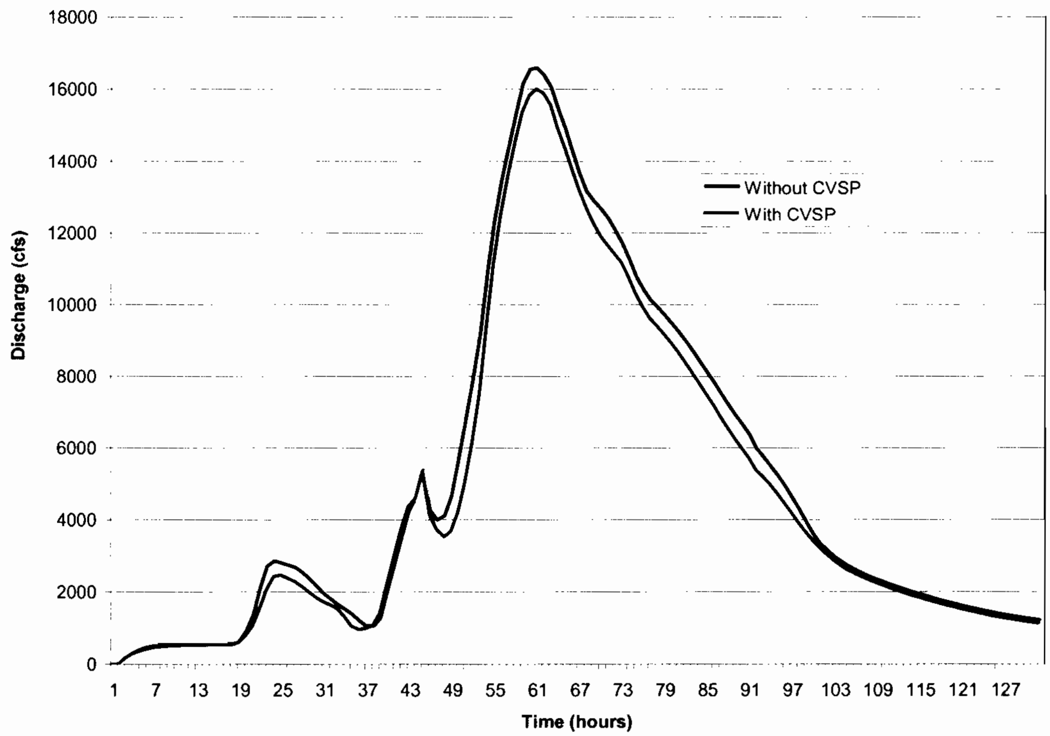

Figure 2-8: Impact of CVSP on Coyote Creek Hydrograph Downstream of Fisher Creek

Table 2-6 lists predicted 100-year discharges for Coyote Creek at William Street with ("Post") and without ("Exist") CVSP development. William Street is located at the creek's historic bottleneck and is the point of initial flooding between Fisher Creek and San Francisco Bay (Figure 2-9). Its bank-full capacity has been estimated to be approximately 9,500 cfs, noting that an upstream capacity of roughly 14,700 cfs downstream of Edenvale limits the discharge of water in the creek channel. Because the initial storage in Anderson Reservoir plays a significant role in the magnitude of downstream flooding, a range of antecedent pool storage has been analyzed, with 81,000 acre-feet representing the modeled 100-year condition (per SCVWD).

Figure 2-9: William Street Park after 1997 Flood.

Table 2-6: CVSP Impact on 100-year William Street Flooding (cfs)

Coyote Creek Flow Parameter	Initial Storage in Anderson Reservoir (acre-feet)									
	10,000		30,000		60,000		70,000		81,000	
	Exist.	Post	Exist.	Post	Exist.	Post	Exist.	Post	Exist.	Post
Peak Discharge Below Fisher Creek (cfs)	5,190	5,170	5,250	5,230	7,770	7,220	10,910	10,250	16,590	16,010
Peak Discharge below Edenvale (cfs)	6,580	6,570	6,650	6,640	7,850	7,310	11,340	10,610	14,700	14,700
Peak Discharge at William Street (cfs)	7,130	7,080	7,200	7,140	7,770	7,240	11,360	10,740	14,700	14,700
Spill at William Street?	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Time of Initial Spill (hours)	---	---	---	---	---	---	66	67	54	56
Duration of Spill (hours)	---	---	---	---	---	---	17	13	30	26

Hydrologic modeling summarized by Table 2-6 demonstrates that plan development would not have an adverse impact on 100-year flood discharges at the point of first release out of the Coyote Creek system. Downstream discharge is limited to channel capacity at William Street and local tributaries unaffected by proposed CVSP development.

2.4.4 *Induced Stream Erosion Inside or Outside of Plan Area*

> A hydrology and water quality impact is considered significant if the plan would alter existing drainage patterns, including streams and rivers, in a manner that would result in significant erosion inside or outside the plan area.

Development in or near a natural floodplain has the potential to change that floodplain by increasing stream discharges (relative to the undeveloped state) and affecting the balance of sediment transport so that bed or bank erosion within the stream begins or is worsened.

2.4.4.1 Defining the Features of a Stable Channel. In recent years, the terms ‘stable’ and ‘sustainable’ have been used more often to describe restoration and project goals. For the purposes of this report, the term ‘sustainable’ is defined as that which is environmentally sensitive, practical, cost-effective, and not only requires a minimum amount of maintenance to perform its function, but also has a minimum negative impact on all related systems. For example, the restoration of Fisher Creek is sustainable because it is designed to be self moderating in terms of sediment budget, it enhances habitat for wildlife and biota, and also provides an environmentally friendly transportation and recreational service (e.g. creek-side trail system).

The term 'stable' is also an important one to define, particularly in the context of sedimentation and erosion:

> "True stability never exists in natural rivers, which frequently change their position and which must continue to pass a range of discharges and sediment loads. However, they can become relatively stable in the sense that, if disturbed, they will tend to return approximately to their previous state and the perturbation is damped down." (Knighton, p. 158)[6]

> "A stable channel is loosely defined as one that neither aggrades nor degrades, but instead maintains its average cross-section, plan form, and profile features over time and within a range of variance. A stable channel can tolerate short-term disturbances without significant change." (HMP Report, p. 3-11)[7]

With no constraints on space or time, the most natural channel would be achieved by simply stopping all human influences and allowing the channel to realign itself. Given enough time with no changes within the watershed, Fisher Creek would eventually become a naturally stable channel, likely resulting in an alignment somewhere between the current manmade channel and the historic alignment. Given the timeframe of the implementation of the CVSP and the fact that land uses have been planned, this natural approach is not feasible.

2.4.4.2 Fisher Creek as a Geomorphologic Stable Channel. The Coyote Valley Specific Plan proposes restoring Fisher Creek utilizing a multi-stage design to create a geomorphologic stable channel providing both flood protection and diverse ecology and habitat opportunities. Given the realities of the need for flood protection within a defined space, a restoration of Fisher Creek to mimic its historic alignment combined with a wide corridor and careful restoration of natural floodplain features presents a unique opportunity to design a stable channel and self-mitigate the potential for development impacts on erosion.

Fisher Creek will be constructed as a multi-stage channel, which has been generally successful at improving stability within incised channels in California (Smith, et al).[8] Some of the features characteristic to a stable channel, which will be incorporated into plans for the Fisher Creek restoration, include:

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[6] Knighton, David, Fluvial Forms & Processes: A New Perspective, Oxford University Press, London, 1998.
[7] Santa Clara Valley Urban Runoff Pollution Prevention Program, "Hydromodification Management Plan Report," Final Draft, March 2004.
[8] Smith, S., P. Bereciatua and J. Haltiner, 1998. "River Channel Design and the role of the Floodplain." EOS, Transactions, Vol. 79, No. 45, p. F349, and American Geophysical Union Fall meeting, 1998, San Francisco, California.

- Diversity in channel cross sections;

- Connectivity between an active low flow channel and an evolving floodplain. The connectivity between a low flow channel and active floodplain reduces flow velocity, stores water, absorbs energy and encourages sediment deposition during over bank flood events. (Haltiner et al)[9]

- A low flow channel placed within a relatively wide floodplain, allowing for natural migration of the low flow channel within the floodplain, and the development of natural pool riffle sequences.

- Multi-stage channel design including a low flow channel, floodplain, public access, and habitat corridor. The multistage approach depends on seasonal flooding of the floodplain which allows sediment deposition in over bank areas.

2.4.4.3 Coyote Creek Stability. While plan development does not impact extreme flood discharges in the creek at its most vulnerable location (Table 2-6), the addition of impermeable areas due to CVSP implementation could increase the flow and duration of runoff during lesser storm events. At some threshold level, precipitation that previously percolated into the soil and entered Santa Clara Valley through the groundwater aquifer at Coyote Narrows could no longer infiltrate, but rather, might enter Fisher Creek or Coyote Creek as surface flow, potentially causing additional erosion downstream.

Procedures outlined by the Santa Clara Valley Urban Runoff Pollution Prevention Program Hydromodification Management Plan (HMP) Report have been utilized to examine Coyote Creek hydrology downstream of its confluence with Fisher Creek to determine if CVSP development might affect its flow-duration characteristics. Releases from Anderson Reservoir dominate the low flow regime in Coyote Creek. Fortunately a 39-year record of daily flow on Coyote Creek immediately downstream of Anderson Reservoir is available. The coincident 39-year record of local rainfall has been used with HMP computational procedures to analyze how proposed development would affect the creek's flow-duration curve over the 39 years of record. The results are presented as Figure 2-10.

[9] Haltiner, J., S. Smith and B. Phillps, 1999. "Integrating Geomorhpic and Engineering Approaches in Stream Restoration," American Society of Civil Engineers presentation, August 1999.

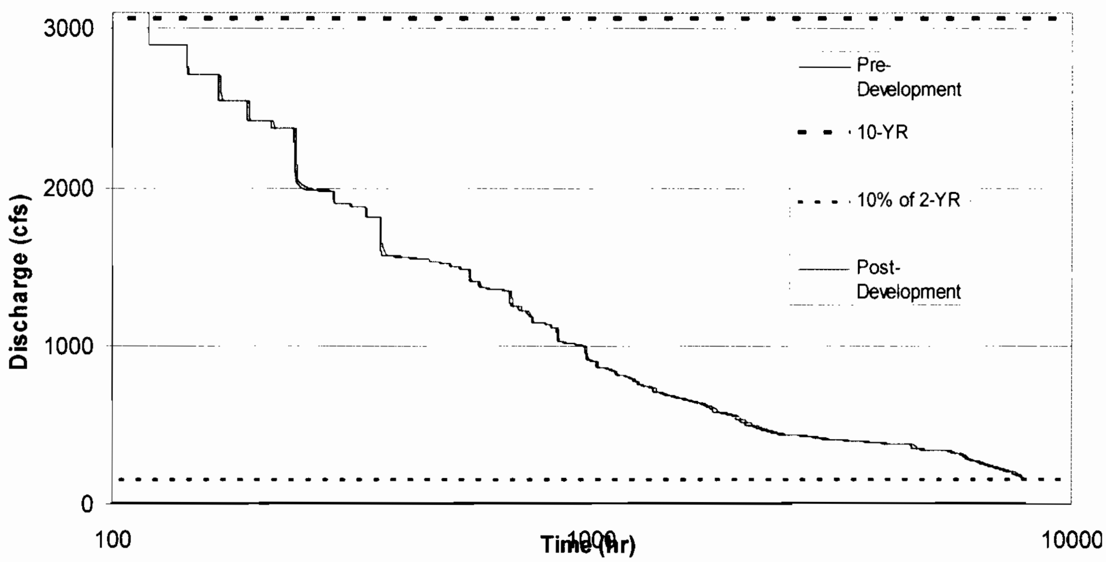

Figure 2-10: HMP Flow Duration Curves for Coyote Creek D/S Fisher Creek.

The flow-duration curve illustrated in Figure 2-10 tracks the number of times in a period of record that discharge exceeds a given value. Visually the difference in flow-duration curves before and after CVSP development is minimal. The post-development condition curve exceeds the pre-development condition curve by an average of 8 cfs, or approximately 2.5 percent of average discharge in relative terms. HMP guidelines specifically allow for the post-development curve to exceed the pre-development curve by up to 10 percent over 10 percent of the length of the curve. In the strictest sense, the post-CVSP flow-duration curve for Coyote Creek does not meet this guideline because the post-development increase occurs over more than ten percent of the curve. However, the variance in Coyote Creek flow due to proposed Coyote Valley development is dwarfed by the variance in historic Anderson Reservoir releases, as demonstrated by Table 2-7.

Table 2-7: Comparison of Low Flow Variance in Coyote Creek

	Flow (cfs)	
	Post-CVSP Increase	Anderson Reservoir Releases
Minimum	0	0
Maximum	339	4170
Average	8	55
Standard Deviation	11	120
Coefficient of Variation	1.4	2.2

The dominance of reservoir releases in the HMP computations coupled with uncertainty regarding future reservoir operation resulting from the Fisheries and Aquatic Habitat Collaborative (FAHCE) settlement make the assessment of future hydromodification due to CVSP development difficult. Chapter 3 provides alternative mitigation measures in light of this uncertainty.

2.4.5 *Additional Sources of Pollution*

> A hydrology and water quality impact is considered significant if the plan would provide substantial additional sources of polluted runoff or otherwise substantially degrade surface or groundwater quality.

Estimating the effects of the CVSP on surface water quality is difficult, as there are no historic or current water quality data available to establish existing conditions. As described previously, water flows year round in lower Fisher Creek, even without rainfall events. This water is primarily due to agricultural runoff. Farms in the area produce primarily row crops and grass farms, which potentially contribute nitrogen, phosphorus, pesticides, fertilizers, sediment, and insecticides. This unseasonable enriched water in Fisher Creek creates reaches that are quite literally overgrown.

Thus, although urbanization of Coyote Valley could certainly change the quality of the surface water runoff, it is difficult to assess what the net long term effect will be, since contaminants introduced due to urbanization will be at least partially offset by the contaminants removed due to decreased agricultural activity. Potential pollutants present in urban areas include automobile hydrocarbons, heavy metals (for example lead, copper, nickel, and zinc), pesticides, sediment and naturally occurring minerals such as serpentine (asbestos) and mercury. These pollutants may be deposited on impervious surfaces (paved roads, parking areas, sidewalks, patios, plazas and roofs) and eventually drain into waterways including Fisher Creek, Coyote Creek and ultimately, San Francisco Bay.

A menu of proposed BMPs for Coyote Valley is provided in Chapter 3. Management practices to ensure that water quality standards are met will be the best available at the time of implementation, and the potential degradation of groundwater or surface waters in Santa Clara County from CVSP implementation is not considered to be a significant impact. The provisions of the SCVURPPP NPDES Permit require each of the co-permittees, including the City of San José, to implement measures/BMPs to reduce stormwater pollution from new development or redevelopment projects to the maximum extent practicable. In addition to the SCVURPPP NPDES Permit provisions, all construction projects in the City of San José are regulated by the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit), which requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP) and the filing of a Notice of Intent

(NOI) with the State Water Resources Control Board (SWRCB) for all projects that disturb an area of one acre or greater.

2.4.5.1 Migration of Perchlorate Plume. As described in Section 1.4.2, perchlorate contamination remaining from the manufacture of highway flares in the neighboring Llagas Groundwater Basin has been migrating to the north and east. While perchlorate has not been detected to date in wells extracting water from the Coyote Groundwater Basin, changes in pumping rates or patterns could potentially induce more water to flow across the groundwater head ridge that separates the Coyote Basin from the Llagas Basin (Figure 1-23). Depending upon the efficacy of ongoing and future perchlorate remediation efforts, this potential additional source of groundwater flow into the Coyote Basin could contain perchlorate in excess of maximum contaminant levels.

The goal of the Santa Clara Valley Water District, as expressed in the Water Supply Assessment, is to provide sufficient natural and artificial recharge to prevent a decline in Coyote Valley groundwater levels (including those in the Greenbelt Strategy Area closest to the perchlorate plume) due to increased pumping. Without a decline in groundwater levels, potentially contaminated groundwater from the Llagas basin should not migrate north into the Coyote basin.

2.4.6 *Structures within a 100-year Flood Hazard Area*

> A hydrology and water quality impact is considered significant if the plan would place structures within a 100-year flood hazard area that impede or redirect flood flows.

By design, the Fisher Creek restoration will contain the estimated 100-year base flood discharge (assuming full CVSP implementation) within its riparian corridor. Therefore, no structures would be located within the 100-year floodplain of Fisher Creek.

A portion of proposed development would encroach into Coyote Creek's westerly floodplain between the creek setback and Monterey Road (Figure 2-11). A detailed HEC-RAS analysis using the published 100-year discharge shows that this floodplain encroachment affects water surface elevations by up to 0.8 foot. When defining regulatory floodways, FEMA does not consider any surcharge less than one foot as a significant impact. While the CVSP development would be padded up above the surcharged water surface elevation, the Coyote Creek Golf Course property located across the creek from the Development Area cannot be expected to do the same. One structure, a refurbished maintenance building, could be impacted by a slight increase in flood depth, although the structure is already subject to 100-year inundation.

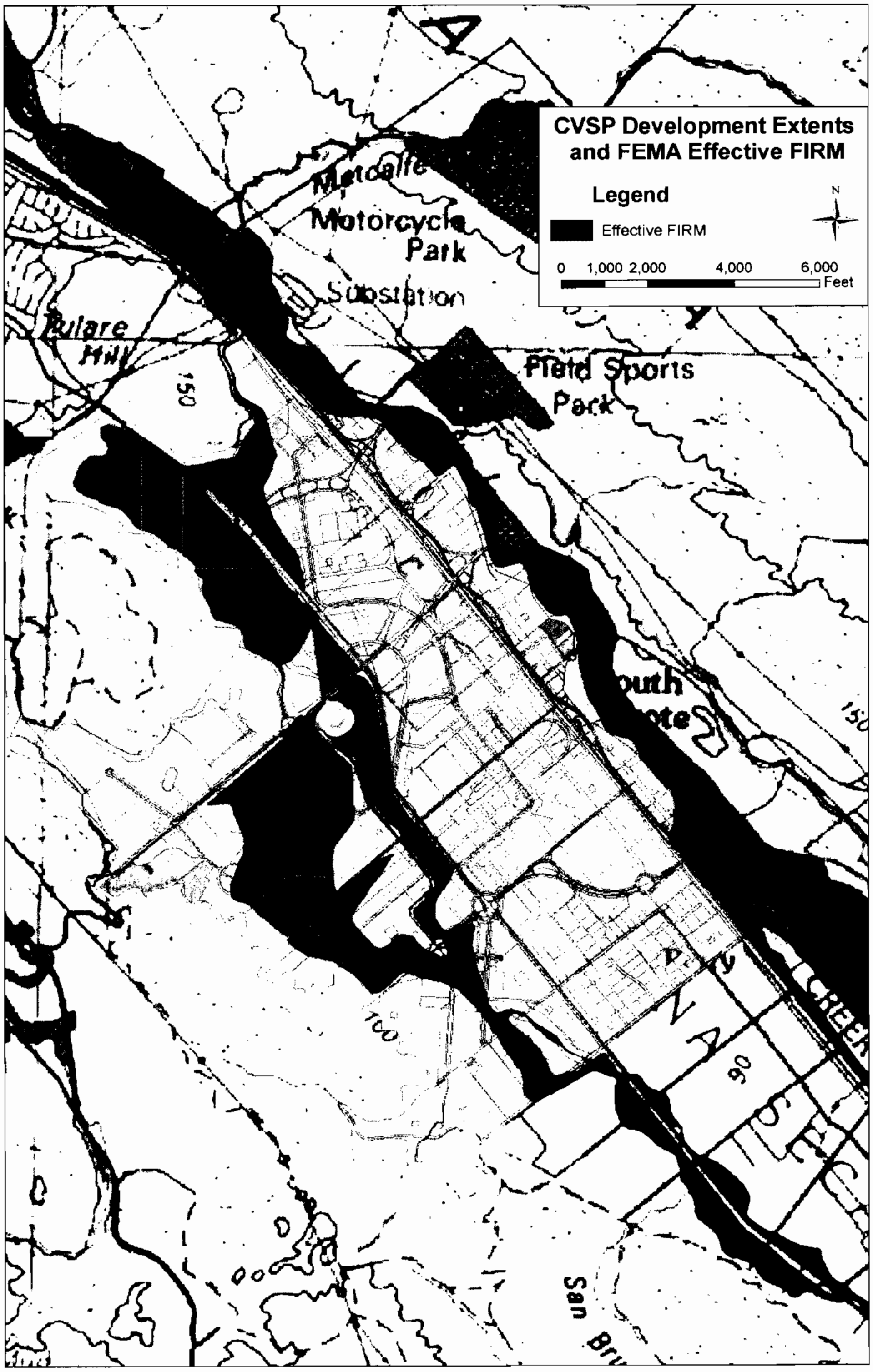

Figure 2-11: Effective Regulatory Fisher Creek and Coyote Creek Floodplains

2.4.7 *People or Structures Exposed to Loss, Injury or Death*

A hydrology and water quality impact is considered significant if the plan would expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

The risk of loss, injury, or death due to flooding from the two primary sources within the Development Area – Fisher Creek and Coyote Creek – has been discussed previously. Fisher Creek and Coyote Creek would provide protection against 100-year flooding in conformance with all National Flood Insurance Program requirements. Nowhere in the Development Area would this flood protection rely upon an artificial levee or floodwall.

While the Plan Area (including the Development Area) is subject to deep inundation should Leroy Anderson Dam fail catastrophically, the dam has been designed and constructed to withstand maximum credible earthquakes, and is inspected twice a year by the District in the presence of representatives from the California Division of Safety of Dams and the Federal Energy Regulatory Commission. So while potential inundation resulting from catastrophic dam failure could damage property and structures within Coyote Valley and pose a severe hazard to public safety, the probability of such failure is extremely remote and therefore not considered a significant hazard.[10]

2.3.8 *People or Structures Exposed to Seiche, Tsunami, or Mudflow*

A hydrology and water quality impact is considered significant if the plan would expose people or structures to inundation by seiche, tsunami, or mudflow.

A seiche is the resonant oscillation of water in an enclosed body of water. For example if one were to sit in a bathtub partly filled with water and rock back and forth at the right period (about one second), the waves created will grow until they overflow the bath. Earthquakes and tsunamis (undersea earthquakes) can generate seiches in an enclosed body of water. The closed bodies of water that could potentially threaten people or property within Coyote Valley through the generation of a seiche include Anderson Reservoir, Coyote Lake and San Francisco Bay. However, Coyote Valley is too remote from the Bay and too elevated to be threatened by tsunamis or a seiche generated from a tsunami. A seiche generated in Anderson Reservoir would be contained by the dam, and in the very unlikely event of a coincidently full reservoir, the waves would generally flow over the spillway into Coyote Creek. Similarly, an emergency spillway planned for Coyote Lake would safely direct any overflow due to seiche into Fisher Creek.

[10] City of San Jose. Draft EIR. iStar General Plan Amendment and PD Zoning Project. October 2005, p. 176.

The Development Area lies below the 15 percent slope line, above which seismically induced landslides have been mapped by the State as a potential hazard. People or structures will not be exposed to mudflow as a result of CVSP implementation as shown by Figure 2-12.

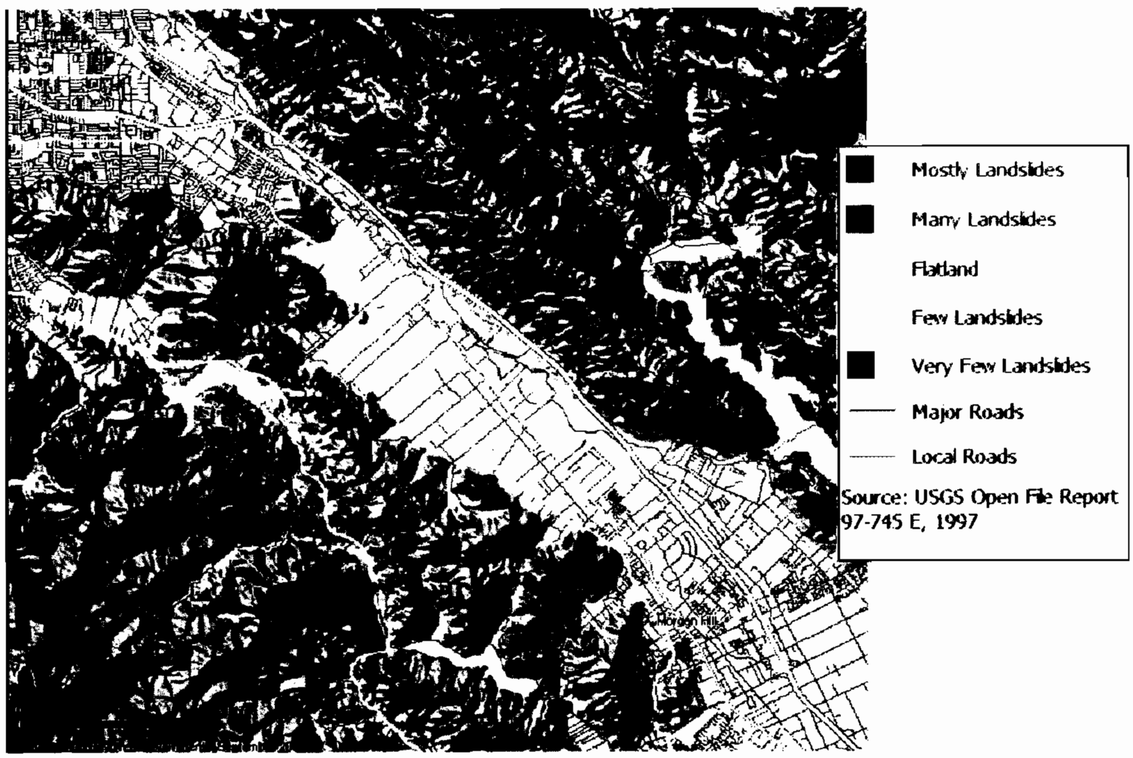

Figure 2-12: Identified Landslide Areas within Vicinity of Coyote Valley (ABAG, 2006)

CHAPTER 3
MITIGATION MEASURES

Chapter 2 discusses how hydrologic impacts would be largely self-mitigated through project design. This chapter summarizes the mitigating aspects of the CVSP and presents additional best management practices proposed for further mitigation and avoidance of environmental impacts. The CVSP has taken a sustainable development approach, such that most water related impacts are mitigated through design. Mitigating aspects of the CVSP are described herein.

3.1 Water Quality Standards

Plan Area development must conform to all promulgated water quality standards and waste discharge requirements. The Clean Water Act prohibits discharge of pollutants to waters in the United States unless the discharge complies with a National Pollutant Discharge Elimination (NPDES) permit. In California, the Regional Water Quality Control Boards administer the national NPDES program by issuing permits. Municipalities with a population greater than 100,000 or those that have been found to be significant polluters are classed as Phase I MS4s (municipal separate storm sewer systems), and must apply for an individual permit. (Smaller cities, community colleges, and so forth are classified as Phase II MS4s and have to show compliance with a general permit.) The City of San Jose is a co-permittee in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPP), meaning that it shares an individual NPDES permit for discharging to the San Francisco Bay with the other 12 members of SCVURPPP. Since the Coyote Valley Specific Plan area lies entirely within the watershed to the Bay, it will fall under the auspices of SCVURPPP. As part of the permit requirements, SCVURPPP has a stormwater management plan that addresses the following eight elements:

- program management
- illicit discharges
- industrial and commercial discharges
- new development and redevelopment, construction
- public agency (municipal) operations
- public information and participation
- program evaluation
- monitoring

3.1.1 NPDES *C.3 Provisions*

In October 2001, the San Francisco Regional Water Quality Control Board changed the requirements for stormwater quality related to new development and redevelopment in the City of San Jose's National Pollutant Discharge Elimination System Permit Provision C.3 to:

(1) implement water quality treatment; and

(2) ensure that flows and durations of stormwater runoff do not increase as a result of new development or redevelopment.

Projects to which the standards apply are anything greater than 5,000 square feet (since October 2004). Treatment Best Management Practices (BMPs) must be sized according to either volume design or flow design basis, depending on which is applicable to the selected BMP.

Treatment options utilizing the percolation of water – infiltration BMPs – can be used only where they do not adversely affect groundwater quality, and are subject to a design criterion of at least ten feet of vertical separation from the groundwater table and horizontal separations from water supply wells (including improperly abandoned wells), underground tanks storing hazardous materials, and septic systems.[1] Given the possibility of depths to groundwater less than ten feet throughout the Plan Area as illustrated in SCVURPPP's "C.3 Stormwater Handbook"[2] (see also Table 1-6 and Figure 1-25), infiltration BMPs are not appropriate in Coyote Valley. In fact, the Santa Clara Valley Water District has prohibited the use of water quality retention basins in Coyote Valley.[3]

3.1.1.1 Volume Design Basis. Treatment BMPs whose primary mode of action depends on volume capacity, such as detention units (with retention prohibited), would be designed to treat stormwater runoff equal to:

a) The maximized stormwater quality capture volume for the area, based on historical rainfall records, determined using the formula and volume capture coefficients set forth in *Urban Runoff Quality Management, WEF Manual of Practice No. 23/ ASCE Manual of Practice No. 87, (1998*), pages 175-178 (e.g., approximately the 85th percentile 24-hour storm runoff event); or

[1] SCVURPPP, "C.3 Stormwater Handbook," Attachment III-3.

[2] ibid, Figure III-1.

[3] Response to Notice of Preparation of a Draft Environmental Impact Report for Coyote Valley Specific Plan, letter dated July 5, 2005.

b) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology set forth in Appendix D of the *California Stormwater Best Management Practices Handbook,* (1993), using local rainfall data.

To provide water quality treatment in conformance with Provision C.3, a system of bioswales and detention basins will be constructed. Figure 3-1 shows a division of the Development Area into twenty local drainage basins on conceptual CVSP storm drain plans.

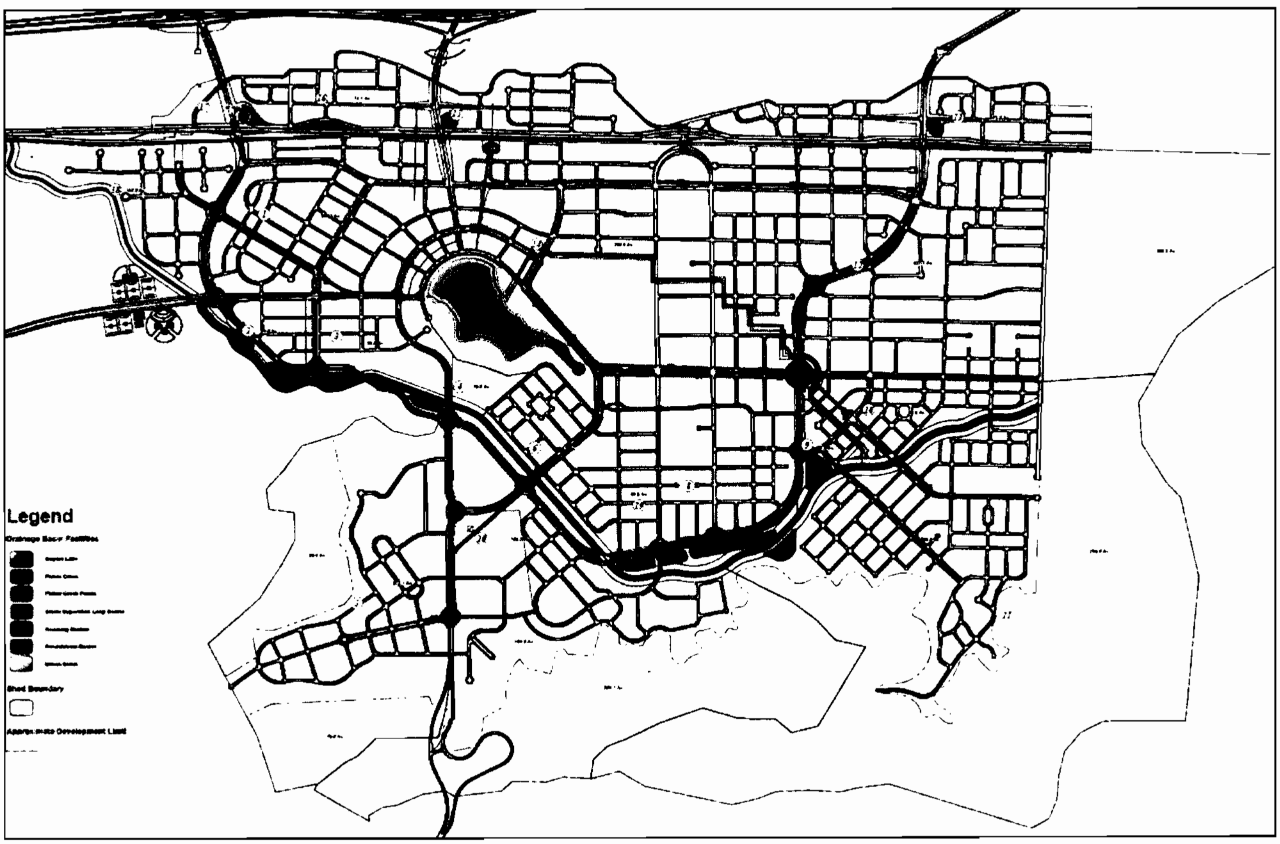

Figure 3-1: Conceptual Drainage Layout with C.3 Basins for CVSP

Using the California Stormwater Best Practices Handbook methodology as outlined by Table 3-1, net required storage volume equivalents are calculated for each of the twenty local drainage basins. Each basin's outlet would be sized to release this volume of water over a 48 hour period.

Table 3-1: C.3 Volume Treatment Basins
(CA Stormwater BMP Handbook Method)

Basin ID	Drainage Area (acres)	Percent Impervious	Mean Annual Precip. (inches)	Precip Correction Factor†	Soil Description	Slope (percent)	Unit Basin Storage (inch)	BMP Volume (acre-feet)
1	268	65	17.8	0.91	silt loam	1	0.68	14
2	32	65	17.8	0.91	clay	1	0.88	2
3	82	65	18	0.92	clay	1	0.88	6
4	20	NO DEVELOPMENT						
5	455	30	20	1.03	silt loam	7	0.26	10
6	101	65	19.5	1.00	clay	1	0.88	7
7	469	30	21.5	1.10	clay loam	15	0.58	25
8	149	65	20.5	1.05	clay	1	0.88	11
9	118	50	21	1.08	clay	1	0.85	9
10	COMBINED WITH BASIN #9							
11	727	30	23	1.18	clay loam	7	0.45	32
12	427	65	20	1.03	clay loam	1	0.72	26
13	72	65	19.5	1.00	clay loam	1	0.75	5
14	784	65	19	0.97	silt loam	1	0.68	43
15	37	65	18	0.92	silt loam	1	0.68	2
16	74	65	17.8	0.91	silt loam	1	0.68	4
17	45	65	17.6	0.90	silt loam	1	0.68	2
18	153	65	17.5	0.90	silt loam	1	0.68	8
19	49	65	20.5	1.05	clay	1	0.88	4
20	162	65	20.5	1.05	clay	1	0.88	12

†Based on Morgan Hill Rain Gage with M.A.P = 19.5 inches.

3.1.1.2 Flow Design Basis. Treatment BMPs whose primary mode of action depends on flow capacity, such as swales, sand filters, or wetlands, are sized to treat:

a) 10% of the 50-year peak flow rate; or

b) the flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or

c) the flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.

3.1.2 *Waiver Program*

City of San Jose policy includes a waiver program whereby projects are allowed to substitute an Alternative Measure in lieu of demonstrating compliance with the numeric sizing criteria for certain projects, including "Transit Oriented Projects". Alternative measures are only loosely defined, but generally refer to treating an equal amount of runoff or pollutant loading off-site (off-site treatment, stream restoration, etc.) Individual projects within the CVSP area will be required to incorporate the post-construction BMPs outlined in Section 3.5 to the maximum extent practicable.

3.1.3 *Other Best Management Practices for Water Quality*

Best Management Practices are to be utilized throughout the development for the treatment of urban runoff as permanent features. Runoff will be directed through a series of permeable pavement and vegetated swales at the scale of individual properties, median strips and parkways at the neighborhood level, and an Urban Canal and Coyote Lake at the plan area level.

Both Fisher Creek and the planned Coyote Valley Lake will provide valuable water quality treatment. The re-aligned Fisher Creek creates an additional 1,100 feet of linear length – providing a greater mixing, settling, and dilution period for urban runoff. As described in detail in Chapter 2, the design of Fisher Creek will be such that there is natural sedimentation on the floodplain of the Creek, further mitigating urban runoff quality. Coyote Valley Lake is a planned 50 acre lake which will provide additional storage and treatment of surface water runoff, by trapping urban sediments that would otherwise be transported down Fisher Creek and Coyote Creek.

3.2 Mitigation against Groundwater Degradation

Increasing artificial recharge to the groundwater basin and utilizing a greater percentage of recycled wastewater will be used to mitigate the additional local groundwater that will be extracted to meet increased demand.

Additional groundwater cannot by law be extracted from the Coyote Groundwater Sub-basin until a Water Supply Assessment demonstrates that there is no adverse impact to local groundwater levels or quality. California Senate Bills 221 and 610 (California Water Code §10919 et. seq.) require that a firm water supply be found prior to any development in excess of existing supply.

3.2.1 *Senate Bill 221*

Authored by State Senator Sheila Kuehl (D-Santa Monica), this legislation prohibits the approval by local government of a tentative or parcel map, or development agreement, for residential subdivisions without first obtaining written proof that "sufficient water supply" for the development exists. "Subdivision" is defined to be a development of more than 500 dwelling units, or one that results in an increase of at least 10 percent in the number of the public water system's existing service connections. "Sufficient water supply" is defined as the total water supplies available during normal, single-dry, and multiple-dry years within a 20-year projection period that meets the projected demand associated with the proposed subdivision development in addition to any existing and planned future use demand.

The government entity responsible for approving the subdivision must notify any water supplier that is or may become a "public water system" that may supply water to the subdivision, and request a written verification from the supplier as to the availability of a sufficient water supply. Written verification of an adequate water supply must be supported by substantial evidence which may include the most recently adopted Urban Water Management Plan (UWMP) or a water supply assessment (WSA) completed in compliance with SB 610, which is described below.

Verification must also include a description of reasonably foreseeable impacts of the proposed subdivision on the availability of water for agriculture and industry within the supplier's service area that are not currently receiving water from the supplier. If the verification provided by the supplier indicates that the supplier cannot provide sufficient water, or if no verification is provided, the city or county may find that additional supplies are or will be available prior to project completion. The finding must be made on the record and supported by substantial evidence. The city or county may additionally work in conjunction with the project applicant and the supplier to secure additional water necessary to meet the subdivision demand. If the city or county secures the necessary water supply, it must work with the supplier to implement a plan to deliver the necessary water to meet the long-term subdivision demand.

3.2.2 *Senate Bill 610*

State Senator Jim Costa (D-Fresno) wrote Senate Bill 610 requiring a water supply assessment for any "project" that is determined by a city or county to be subject to the California Environmental Quality Act (CEQA). In conjunction with the Santa Clara Valley Water District, the City of San Jose has prepared a Water Supply Assessment (WSA) as described fully in that document, which is appended to the Draft EIR.

3.2.3 *Coyote Valley Water Supply Assessment*

Protections afforded by SB221 and SB610 ensure that groundwater extractions cannot exceed available sources of recharge and induce a long-term lowering of groundwater levels. The Santa Clara Valley Water District has prepared numerical groundwater models reflecting the ultimate basin and development conditions outlined herein to assist the City with its Water Supply Assessment. To meet legislative requirements and provide a sustainable water supply for Coyote Valley and the rest of Santa Clara County, the District's groundwater management programs are actively dealing with groundwater recharge, treated groundwater recharge/re-injection, and water use efficiency. The overall goals of their management programs are to sustain groundwater supplies, mitigate groundwater overdraft, minimize land subsidence, protect recharge and pumping capabilities, and sustain water storage reserves for dry period use.

The WSA also identifies alternative measures that will mitigate the potential for declining groundwater levels or water quality within the Coyote Groundwater Sub-basin and its adjoining groundwater sub-basins. Reference is made herein to the WSA for greater detail, but in summary groundwater mitigation includes several elements.

The Santa Clara Valley Water District Urban Water Management Plan (UWMP) includes CVSP water demands in its future water demand projections. Water supply throughout Santa Clara County is integrated, and as such the demands specific to CVSP are also integrated into County-wide water supply management planning. The UWMP concludes that water supply will meet projected water demands through 2030 for normal, single dry, and multiple dry years through a combination of:

- The District's "No Regrets" portfolio;
- Water Conservation; and
- Significant investments to preserve and protect existing water supplies while developing new water supplies.

Although the UWMP concludes that there will be sufficient water supplies to meet increased water demands from CVSP and other projected county-wide growth and development through 2030, the UWMP does not specifically address how increased supplies would be delivered to the Plan Area and mitigate against the potential degradation of the Coyote Valley Groundwater Sub-basin due to annual extractions that exceed the existing natural and artificial recharge rates. The WSA therefore addresses the delivery issue as summarized below and in Figure 3-2.

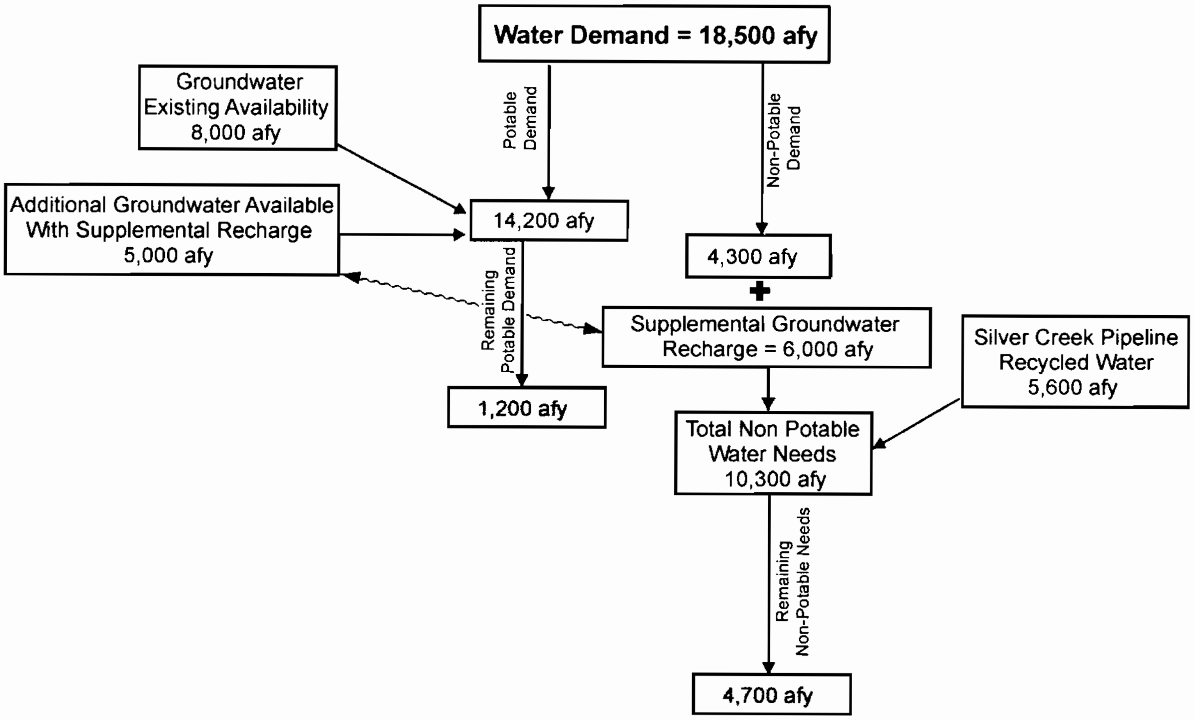

Figure 3-2. Coyote Valley Water Availability and Remaining Needs

3.2.4 *Additional Recharge*

The SCVWD has performed detailed numerical modeling to investigate the potential impacts of additional groundwater extractions from the Coyote Sub-basin. The District has established that an increase of 6,000 acre-feet per year of artificial recharge is required to safely extract an additional 5,000 acre-feet per year of groundwater from the basin. The maximum safe extraction of local groundwater without basin degradation is 13,000 acre-feet per year. Recharge sites may include percolation basins located within the Coyote Greenbelt, or in-stream recharge within a relocated Fisher Creek, most likely south of Bailey Avenue. Sources of additional recharge may include untreated water from the Cross Valley Pipeline (Figure 3-3) and/or advanced treated recycled water obtained by extending the existing pipeline from its present terminus near Metcalf Energy Center (Figure 3-4), and constructing a new advanced treatment facility, possibly within the Plan Area. (Such a treatment facility is not included in the CVSP and would require additional environmental review.)

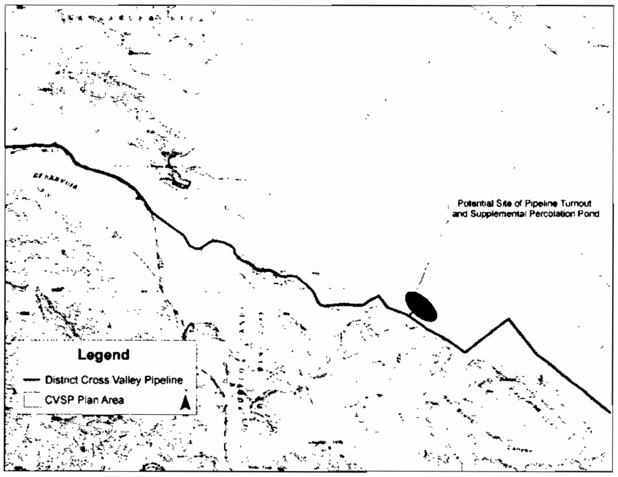

Figure 3-3. Cross Valley Pipeline Delivery

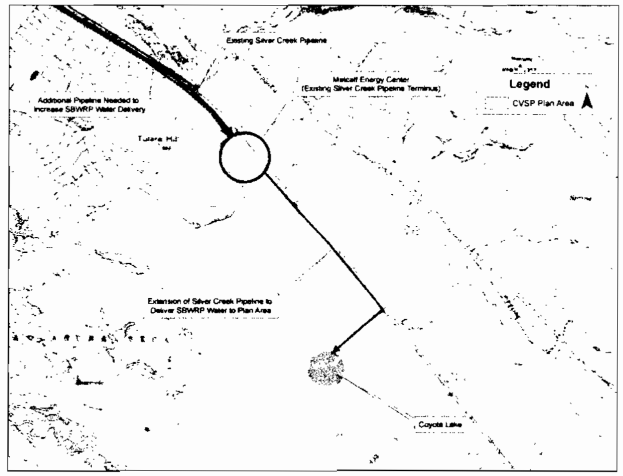

Figure 3-4. Recycled Water Delivery

3.2.5 *Additional Water Supply for Direct Non-potable Use*

Water demands for landscape irrigation, refilling Coyote Lake (water is constantly lost due to surface evaporation), and other appropriate non-potable use could be satisfied by the direct use of advanced treated recycled water, delivered to or generated and treated within the Plan Area as described in Section 3.2.4. Recycled water would (and should) be used in lieu of potable water for non-potable demands, thus freeing other available sources for potable use. This alternative is distinguished from the prior alternative since the use of recycled water would be direct rather than an indirect use through groundwater recharge.

3.2.6 *Additional Water Supply for Direct Potable Use*

Part of the water demand in excess of maximum allowable groundwater extraction could be met using water delivered to Coyote Valley from the existing Santa Teresa Water Treatment Plant (Figure 3-5), a new water treatment plant built in south Santa Clara County, or groundwater extracted from the Santa Clara Sub-basin north of the Narrows, where groundwater reserves exceed those in Coyote Valley by more than a factor of ten, delivered by pipeline into the Plan Area (Figure 3-6).

3.2.7 *Water Conservation Measures to Reduce Supplemental Deliveries*

Another approach that mitigates potential groundwater degradation is to decrease the water demand of the CVSP. Water demand projections for CVSP have been derived using unit factors from SCVWD and other agencies; these factors are based on standard water conservation measures. For residential, commercial and industrial use, however, unit water demands could be further reduced through more aggressive water conservation practices, some variation of which are already required by the City of San Jose's Municipal Code.

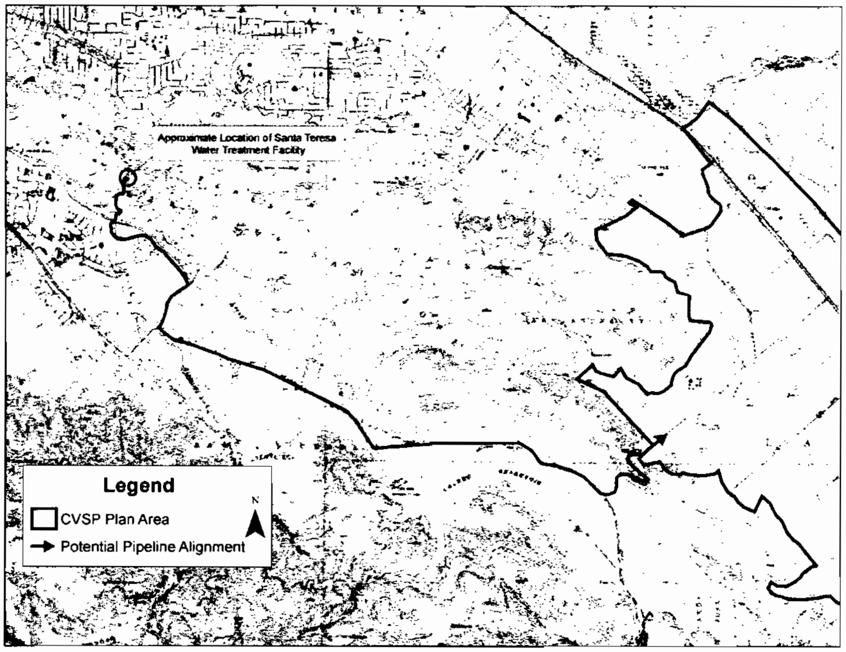

Figure 3-5. Delivery of Potable Water from Santa Teresa Treatment Plant

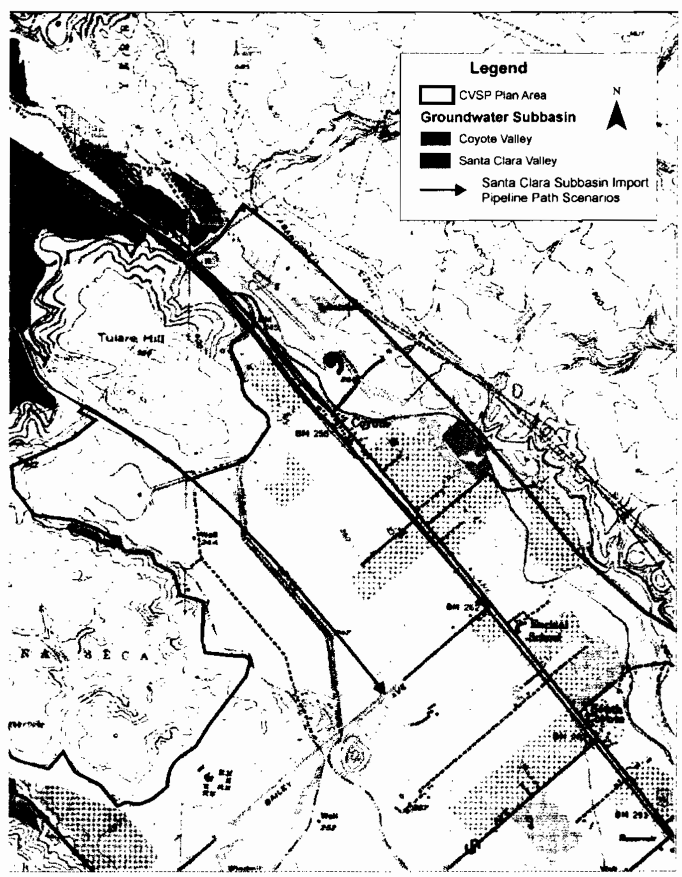

Figure 3-6. Potable Water Deliveries from Santa Clara Sub-basin

3.3 Preservation of Floodplain Storage

Laguna Seca will provide flood attenuation while maintaining its seasonal wetland and meadow habitats. This multi-purpose use will be accomplished in conjunction with the already permitted conveyance and storage improvements designed for the Coyote Valley Research Park now under construction. Fisher Creek will also be restored as part of the CVSP, which increases flood protection capacity while mitigating the need for hydrograph modification by designing a stable channel, as well as providing increased in-stream water treatment and sediment capture.

Fisher Creek and Laguna Seca floodplain storage as integrated into the project are sufficient to prevent an increase in 100-year discharge downstream of the confluence with Coyote Creek as described in Section 2.4.3.3. Further mitigation is therefore not required.

3.4 Mitigation against Induced Erosion

Flow management can also be accomplished via the C.3 provisions through the implementation of a Hydrograph Modification Management Plan (HMP) which is based on a hydrologic analysis of the project area. Current guidelines for this provision indicate that pre-urbanized flow-duration curves must be matched using continuous rainfall simulation and a threshold discharge for erosion in receiving waters.

Per Permit Provision C.3.f.ii., projects located within areas that drain to stream channel segments that are unlikely to erode or experience impacts from increased flows (i.e. stable channel segments) are exempt from HMP requirements. The HMP Report also states that specific project characteristics may make it exempt from HMP requirements. CVSP meets HMP exemption requirements based on both project characteristics and the condition of the stream segment(s) to which the project ultimately discharges. Fisher Creek, as Section 2.4.4.2 describes in detail, would be restored as geomorphically stable channel for post-project hydrologic conditions. Meeting pre-project conditions in this reach is not relevant, since the creek will he relocated and restored. Thus, with a primary project goal of created a stable channel along the restored section of Fisher Creek, additional hydrograph modification mitigation is not required.

As illustrated by Figure 2-10, CVSP development would not substantially modify the low flow characteristics of Coyote Creek at the Fisher Creek confluence. Furthermore, low flow releases from Anderson Reservoir dominate the behavior of the creek's flow-duration curve. According to the HMP Report, "...mitigate[ing] hydromodification impacts from urbanization will not address problems generated from other sources of impacts, such as dam and reservoirs." (p.3-20). The effect of Anderson Dam on hydromodification flows within Coyote Creek is so significant that HMP mitigation becomes very difficult to design using the criteria outlined in the HMP Report. As such, neither the pre-project nor post-project condition of Coyote Creek resembles a natural state. It is also possible that the existing condition along Coyote Creek is "better" than pre-urban conditions prior to the construction of Anderson Reservoir and its regulatory capacity.

Hydromodification mitigation for CVSP will therefore consist of a combination of these two program elements:

1. The Santa Clara Valley Water District will be asked to quantify future reservoir operations, determine which reaches of Coyote Creek are indeed threatened by potential changes in the low flow regime, and assign relative impacts to CVSP and future reservoir operation changes. CVSP could contribute funding toward creek stability projects in direct proportion to its potential impact.

2. Despite the relatively low predicted impacts due to CVSP development, and the computational impossibility of forecasting the impact of future reservoir releases, hydrograph modification basins will be constructed as part of the specific plan, independent of any potential impact to Coyote Creek. These basins provide water quality benefits in compliance with NPDES C.3 Provisions and are intended to further City of San Jose goal of environmental sustainability.

3.4.1 Coyote Creek Stability

Although Coyote Creek is not listed by the SFRWQCB as an impaired stream with respect to sediment TMDLs,[4] the final HMP report does not exempt Coyote Creek from hydrograph modification management upstream of its tidally influenced reach. The San Francisco Estuary Institute (SFEI) published a report containing voluminous research into the historic ecology of Coyote Creek in eastern Santa Clara County, including a discussion of bed form changes within the main stem of Coyote Creek since the time of initial Euro-American contact.

Their research shows that even with extensive land use and drainage density changes over the centuries, Coyote Creek is relatively stable in channel form, both laterally and in bed elevation. According to their report, "…the historical course of the [Coyote Creek] main channel closely matches the present-day channel location in almost all places," and that historic changes in channel alignment tended to result from natural channel migration in the mid to late nineteen century.[5]

[4] California Department of Environmental Protection, San Francisco Regional Water Quality Control Board, "Total Maximum Daily Loads (TMDLs) and the 303(d) List of Impaired Water Bodies." (www.swrcb.ca.gov/rwqcb2)
[5] Grossinger, et al (2006) "Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California." (pp IV-21 through IV-36)

Furthermore, evidence of channel migration within isolated reaches of Coyote Creek downstream of the Narrows (e.g. near Kelley Park) indicates "all of the lateral channel movement….has taken place within the well-defined outer channel banks documented along most of the creek's length….The channel appears to have maintained a degree of dynamic equilibrium, with lateral migration contained within the overall channel area of flood-prone benches and terraces." Efforts to understand Coyote Creek bed profile changes over the years are complicated by widespread land subsidence, surveying accurancy. datum changes, and the lack of well documented data. Available data suggest that Coyote Creek has been generally incising over recorded history, perhaps as much as ten feet in 125 years at Santa Clara and Williams Street. However, Coyote Creek's natural entrenchment and the area's subsidence may have combined to limit channel incision. Over the past quarter century, incision has probably been limited to two or three feet in the worst areas. (SFEI, 2006)

Neither SFEI's research nor an independent research of the literature uncovered specific creek locations with impaired bed or bank stability under lower flow regimes (i.e. less than 10-year return period). If it can be demonstrated that the risk of erosion due to increased runoff from CVSP is minimal, or in-stream measures are provided to control that erosion, on-site HMP is not required.

3.4.2 Local Hydromodification Basins

To provide water quality treatment in conformance with Provision C.3, a system of bioswales and storage basins is proposed as described in Section 3.1.1. These basins could also serve a dual purpose as hydromodification management plan (HMP) basins.

A rainfall-runoff model simulation using 53 years of local rainfall has been used to preliminarily size detention ponds that would limit the post-development flow-duration curve to the pre-development curve for each basin shown in Figure 3-1. (Appendix I.4 contains detailed summaries of these simulations). HMP basins are sized to produce flow-duration curves equal to or less than the existing conditions curve, specifically between the flows of the 10-year flood and 10 percent of the 2-year flood for each basin. Flows and durations below 10 percent of 2-year flow rates are not matched, since it has been determined that flows below this rate are inconsequential to further stream degradation.

Another criterion each pond must meet is the ability to drain completely after three to five days for vector control. Whether or not these two criteria, flow-duration and time to drain, can be met depends on whether water is allowed or able to percolate through the floor of the basin. As stated previously, infiltration basins will be prohibited in Coyote Valley. Therefore an analysis has been completed to assess the possibility of meeting both HMP requirements (flow-duration and time to drain) without soil infiltration. The results of this analysis are indicated by Figure 3-2. Basins constructed within the red shaded areas could not technically comply with all HMP requirements. Without percolation, some of the individual HMP basins sized to match pre-developed flow-duration curves would not drain for long periods of time (up to 125 days), potentially creating serious vector control problems.

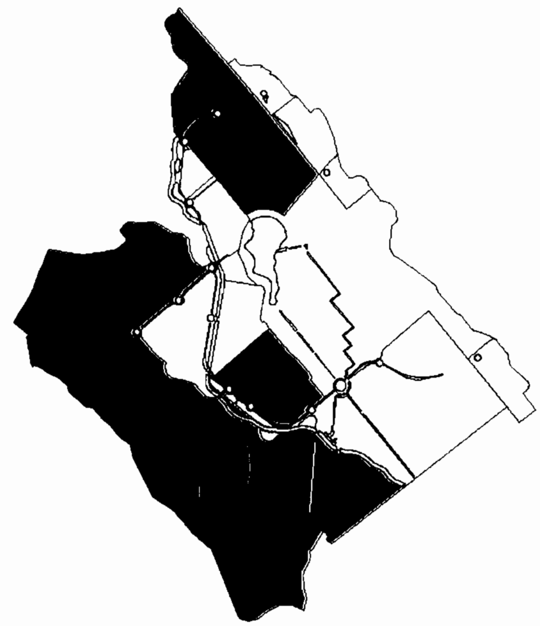

Figure 3-2. Areas within CVSP where all HMP Requirements Cannot be Met (shown in red)

This is not a reasonable approach, and since HMP basin size without percolation is also untenable, breaking the percolation prohibition constraint has been selected herein to illustrate the possible efficacy of available mitigation sites. Further analysis and sizing of HMP basins is based upon the assumption that natural soil percolation takes place relative to the infiltration capacity of the soil type underlying each basin. All other HMP criteria are applied. Table 3-2 summarizes the results of HMP basin sizing calculations.

Coyote Lake is assumed to have an impermeable liner that prevents storm water percolation. The goal is for maximum water depth within any pond (over the 53-year simulation period; equivalent to greater than a 100-year event) to be between five and eight feet. Due to the need for rapid basin drainage, maximum pond depths and footprints are unique functions of the computational process; for example, a 10-acre basin 5 feet deep would not operate as a 5-acre basin 10 feet deep basin would.

The Development Area is underlain by several types of soil: moderately well-drained Type B soils (Arbuckle-Pleasanton and Yolo); slower draining Type C soils (Los Gatos-Gaviota, Vallecitos and Zamora-Pleasanton); and poorly drained Type D soils (Sunnyvale-Castro-Clearlake and Clearlake-Campbell). Where a drainage area overlies soils of relatively high permeability, particularly Type B soil, it can be very difficult to meet HMP requirements with or without percolation since so little runoff is generated during the lighter rainfall events that predominate over the period of record.

Table 3-2: HMP Detention Summary for CVSP

Basin ID	Soil Percolation Required[†]	Drainage Area (acres)	Required Pond Footprint (acres)	Pond as a Percentage of Total Land Use	Maximum Water Depth (feet)	Area Reserved in CVSP (acres)	Area Shortfall (acres)
1	Yes	268	26	10%	4.6	3	23
2	No	32	7	22%	2.8	7	0
3	No	82	2	2%	6.1	2	0
4	n/a	20	NO DEVELOPMENT				
5	Yes	455	10	2%	6.9	7	3
6	No	101	1	1%	7.9	0	1
7	Yes	469	7	1%	8.0	0	7
8	Yes	149	15	10%	1.2	15	0
9	No	118	8	7%	2.8	8	0
10	COMBINED WITH BASIN #9						
11	Yes	727	16	2%	7.0	7	9
12	No	427	12	3%	7.1	12	0
13	Yes	72	1	1%	7.9	1	0
14	No	784	50 acre COYOTE LAKE		4.8' Lake Surface Rise		
15	Yes	37	1	3%	5.0	1	0
16	Yes	74	3	4%	4.8	3	0
17	Yes	45	1	2%	4.9	1	0
18	Yes	153	3	2%	7.8	0	3
19	Yes	49	4	8%	2.7	4	0
20	No	162	4	2%	6.7	5	0

[†]Basin impossible without infiltration.

Each basin described in the fourth column of Table 3-2 adequately modifies the post-development hydrograph to match the hydrograph of the existing conditions within the required parameters of the 10-year flood event and 10 percent of the 2-year flood event. The presented results are approximated at a level appropriate to the task at hand and level of detail provided with the land use plan. Further optimization would be necessary during detailed design if this mitigation approach is selected.

3.5 Best Management Practices to Minimize Additional Sources of Pollution

Permanent BMP design features could include, but are not limited to, the following if approved:

- Infiltration basins – shallow impoundments designed to collect and infiltrate storm water into subsurface soils. The District requests that infiltration basins not be used in Coyote Valley due to the potential impact to groundwater quality in the unconfined basin.
- Infiltration trenches – long, narrow trenches filled with permeable materials designed to collect and infiltrate storm water into subsurface soils.
- Permeable Pavements – permeable hardscape that allows storm water to pass through and infiltrate subsurface soils.
- Vegetated Filter Strips – linear strips of vegetated surface designed to treat sheet flow from adjacent surfaces.
- Vegetated Swales – shallow, open channels with vegetated sides and bottom designed to collect, slow, and treat storm water as it is conveyed to downstream discharge point.
- Flow-through Planter Boxes – structures designed to intercept rainfall and slowly drain it through filter media and out of planter.
- Media Filtration Devices – two chamber system including a pretreatment settling basin and a filter bed.
- Green Roofs – vegetated roof systems that retain and filter storm water prior to drainage off building rooftops.
- New trees planted within 30 feet of impervious surfaces and existing trees kept on a site if the trees' canopies are within 20 feet of impervious surfaces, will count toward 100 square feet of Post-Construction Treatment Control Measure Credit (TCM) for each new deciduous tree, and 200 square feet of TCM may be given for each new evergreen tree. The credit for existing trees is the square-footage equal to one-half of the existing tree canopy. (No more than 25 percent of a site's impervious surface can be treated through the use of trees.) New trees required by the City of San Jose for tree removal mitigation, to fulfill City street tree requirements, or to meet storm water treatment facility planting requirements will not count toward TCM. During the life of a development, a TCM Credit tree shall not be removed without approval from the City, and trees that are removed or die shall be replaced within six months with species approved by the City.[6]

[6] City of San Jose Policy Number 6-29, "Post-Construction Urban Runoff Management," Revised May 17, 2005.

3.5.1 *Stormwater Management during Construction*

Separate from the post-construction BMPs described previously, any project within the CVSP area will need to comply with all requirements regarding State Water Resources Control Board's National Pollutant Discharge Elimination System (NPDES) General Construction Activities Permit. Therefore, prior to the commencement of any clearing, grading, or excavation, each project shall:

a) Develop, implement, and maintain a Stormwater Pollution Prevention Plan (SWPPP) to control the discharge of stormwater pollutants including sediments associated with construction activities. The methods outlined in the SWPPP may include, but are not limited to protection of inlets, stabilized entrance to the site, straw waddles, and hydroseeding; and

b) File a Notice of Intent (N01) with the State Water Resources Control Board.

Along with NOI and SWPPP, the applicant may also be required to prepare an Erosion Control Plan in accordance with the requirements for the City Grading Permit. The Erosion Control Plan may include BMPs as specified in the California Stormwater Best Management Practice Handbook for reducing impacts on the City's storm drainage system from construction activities. The City's Director of Public Works must approve the Grading Permit, including the Erosion Control Plan.

APPENDIX I.1
GLOSSARY

ABAG	Association of Bay Area Governments
Acre-foot	A quantity of water that would cover 1 acre to a depth of 1-foot, equal to about 325,000 gallons.
Aggradation	The geologic process by which streambeds and floodplains are raised in elevation by the deposition of material eroded and transported from other areas. It is the opposite of *degradation*.
Alluvium	Materials deposited by the action of running or receding water.
Aquiclude	A saturated permeable geologic unit incapable of transmitting significant quantities of water under ordinary hydraulic gradients.
Aquifer	A saturated permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic gradients.
Aquitard	Less permeable geologic unit that while they may be permeable enough to transmit water, its permeability is not sufficient to allow the completion of production wells within it.
Attenuation	Using storage volume to reduce the rate of runoff downstream.
Balanced Basin	A groundwater basin where the total amount of water coming into the basin is roughly equal to the total amount of water leaving the basin. Groundwater levels are stable.
Basin	A geologic unit containing surface water and groundwater resources. Also the area drained by a river and its tributaries.
Backwater	Water held back by a downstream control such as a bridge, constricted channel, or tide.
Bedrock	Solid rock underlying more recent geologic formations.
bgs	Below ground surface.
BMP	Best Management Practice.
Bypass	A facility in which floodwater is *diverted* around a channel reach with limited capacity.

Canal	A man-made facility that transports water.
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act.
cfs	A rate of flow equivalent to 1 cubic foot, or about 7.5 gallons, passing a point during 1 second (450 gallons/minute).
City	City of San Jose, California
CLOMR	Conditional Letter of Map Revision, a document issued by FEMA stating that if certain conditions are met, changes will be made to an effective FIRM to reflect a flood mitigation project built as proposed.
Confined Aquifer	An aquifer confined between two aquitards. The water level in a well usually rises above the top of the aquifer ("artesian conditions"). An aquifer with water rising above the ground surface exists under "flowing artesian conditions".
Confluence	The junction of two streams.
Conjunctive Use	Optimizing the surface water and groundwater resources within a watershed.
Consumptive Use	Total evaporation from an area plus the water used directly to build plant tissue; also referred to as *evapotranspiration*.
Conveyance	The ability of a stream or channel to pass a certain rate of flow.
Creek	A natural course of water flowing on the earth. Synonymous with "stream" or "river"; the naming of watercourses being fairly arbitrary with respect to discharge.
Cross Section	A vertical section of a stream channel or structure that provides a side view of the structure; a transect taken at right angles to flow direction.
CVP	Central Valley Project, a federal water storage and delivery system.
CVRP	Coyote Valley Research Park.
CVSP	Coyote Valley Specific Plan.

Degradation The geologic process by which stream and river beds lower in elevation. It is the opposite of *aggradation*.

Design Flow The magnitude of streamflow (see *discharge*) that is used in design of channel modifications and structures across channels.

Discharge The volume of water passing through a channel during a given period of time, usually measured in cubic feet per second. Also: the removal of water from an aquifer (saturated zone) across the water table surface, together with the associated flow away from the water table within the aquifer.

District Santa Clara Valley Water District.

Drainage The movement of surface water from higher elevations to lower elevations.

Drawdown A drop in groundwater elevations or potentiometric surface (for confined aquifers) around a pumping well in response to groundwater extraction. Also known as a cone of depression.

Drought An extended period with below normal precipitation. The term is also used in the context of a lack of water supply.

DWR California Department of Water Resources

EIR Environmental Impact Report

Ephemeral Stream A stream that flows briefly only in direct response to precipitation in the immediate locality and whose channel is at all times above the water table. See also *perennial stream*.

Evaporation The process by which liquid water is transformed into vapor. Solar heating is the predominant mechanism for evaporation, which is also used to define the net rate of vapor transport to the atmosphere.

Evapotranspiration The total evaporation from an area – combined evaporation plus transpiration – or the total *consumptive use* of an area.

FEMA Federal Emergency Management Agency, now operating under the Department of Homeland Security.

FIRM Flood Insurance Rate Map.

FIS Flood Insurance Study.

Flooding A condition in which there is a great overflow of water, such as a body of water inundates land that is normally dry.

Floodplain An area of land inundated by *floodwaters*. Floodplains may consist of standing or moving water.

Floodwaters Those flows of water that cannot be contained within the natural stream channel.

Freeboard Vertical distance between the top of an embankment adjoining a channel and the water level in the channel. It is a factor of safety designed into a project.

Gaining Creek A surface water stream that receives base flow from an aquifer.

Geologic Formation A unique subsurface structure formed by a geologic process (e.g. deposition) at a point in geologic time.

Geomorphology The study of natural water courses, how they are formed, and their natural behavior.

Gradient A term referring to slope (the rate at which something rises or falls).

Gravel Sediment particles larger than sand and ranging from 0.25 to 3 inches in diameter.

Groundwater Water beneath the ground surface held within soils and geologic formations that are fully saturated.

Groundwater Divide An imaginary impermeable boundary across which there is no flow. Generally coincides with surface water divide. The actual divide is not precise and may vary in time with pumping patterns, basin inflows and basin discharges.

Heterogeneous Materials in close proximity with differing qualities and properties.

HMP Hydromodification Management Plan

Hydrograph	A plot of *discharge* (flow) against time.
Hydrogeology	The study of geology as it impacts the movement of water into and out of subsurface formations.
Hydrology	The study of the waters of the earth, their occurrence, circulation, and distribution; their chemical and physical properties; their reaction with the environment; and their relationship to living things.
Impermeable	In hydrology, a material that does not allow for the significant passage of water. (Also: Impervious.)
Incised	A channel cut into the surface soils by the force of flowing water.
Infiltration	The entry into the soil of water made available at the ground surface, together with the associated flow away from the ground surface within the unsaturated zone.
Inundation	A condition in which land is covered by (usually) standing water.
Irrigation	The artificial application of water to crops and landscaping by spraying or flooding.
IWRP	SCVWD Integrated Water Resources Plan.
Levee	Manmade feature above the natural ground surface adjacent to a channel bank that has been constructed to contain high flows.
Lithology	Physical makeup – including mineral composition, grain size and grain packing – of sediments or rocks that make up a geologic system.
Losing Creek	A surface water channel that loses water to (recharges) a groundwater aquifer.
Low Flow Channel	A subchannel of the main stream channel that is designed to concentrate low flows for biological or aesthetic reasons.
Meander	The tendency of natural water courses to wind their way through a floodplain.
mg/l	Milligrams per liter; a measure of concentration equivalent to one part per million.

Mitigation To moderate, reduce, alleviate the impacts of a proposed activity; includes, in order: (a) avoiding the impact by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (e) compensating for the impact by replacing or providing substitute resources or environments. (Council of Environmental Quality, 1978.)

Nitrate Groundwater contaminant that is a byproduct of agricultural activities and subsurface sewage disposal. High concentrations are problematic for infants; who may suffer from a condition called methemoglobinemia, or "blue baby syndrome".

NGVD The *mean sea level* in 1929. National Geodetic Vertical Datum.

NFIP National Flood Insurance Program.

NPDES National Pollutant Discharge Elimination System.

100-Year Flood The *one-percent flood.*

1% Flood A flood magnitude that has a one percent chance of being equaled or exceeded in any one year.

Outcrop Bedrock exposed above the ground surface.

Overbank In a river or creek, the area between the main channel and the limits of the *floodplain.*

Overdraft To extract more water from a groundwater basin than is recharged over a period of time, commonly one year.

Overflow *Floodwater* that leaves a channel over its bank(s).

Perched A stream set above its natural floodplain. Formed due to alluvial action, water spilling out of the stream will flow away from it. The term also refers to a shallow groundwater table located above a deeper aquifer, usually separated by a confining layer of impermeable material.

Percolation	See *infiltration*. Often refers to infiltration through artificial means.
Perennial	A stream that flows continuously throughout the year. See also *ephemeral stream*.
Phreatophytes	Plants with roots located below the water table that extract moisture directly from the saturated zone. Examples include willows and cottonwoods.
Plant Uptake	See *evapotranspiration*.
Pond	An enclosed body of water, usually smaller than a lake.
Porous	Full of pores so that liquid will pass through. (Also: permeable, pervious.)
Precipitation	Atmospheric water vapor that condenses and falls to the ground as rain, sleet, snow or hail.
Pumping	The extraction of groundwater from an aquifer through a well.
Reach	A subdivision of a creek for convenience of study and reference.
Recharge	The entry of water made available at the water table surface to the saturated zone of an *aquifer*. Also, the associated flow away from the water table within the aquifer.
Reservoir	A man-made facility that stores water.
Riparian	Vegetation and wildlife living within, and immediately adjacent to a river, stream or lake. In this report, riparian means the creek environment.
RWQCB	Regional Water Quality Control Board
Saturated	All of the voids in a porous medium are filled with water.
SBWRP	South Bay Water Recycling Program
SCRWA	South County Regional Wastewater Authority
SCVURPP	Santa Clara Valley Urban Runoff Pollution Prevention Program

SCVWD	Santa Clara Valley Water District.
Septic System	The treatment of raw household wastes (sewage) by infiltration through soil to the groundwater table.
SFHA	Special Flood Hazard Area
SJWC	San Jose Water Company
SPRR	Southern Pacific Railroad (now Union Pacific Railroad)
Strata	A (usually) horizontal layer of soil or rock with similar geologic properties.
Stratigraphy	Relationship between various lenses, beds and formations in a geologic system.
Subbasin	A distinct hydrogeologic unit that is part of a larger unit.
Subsidence	The compaction of an aquifer-aquitard system due to groundwater pumping. Compaction causes the land to settle. Widespread settlement is called "land subsidence".
Surface Water	Water present above the ground surface.
SWP	State Water Project, operated by the California Department of Water Resources to store and deliver water supplies.
SWPPP	Storm Water Pollution Prevention Plan.
SWRCB	California State Water Resources Control Board.
Transpiration	A process by which water is evaporated from the airspaces in plant leaves. Water absorbed through the root systems of plants that escapes through pores in the leaf system.
Unconfined Aquifer	An aquifer where the water table forms the upper boundary. Unconfined aquifers generally occur near the ground surface.
Unconsolidated	Subsurface soils and rocks that have not been so compressed as to have all water removed from their pores.

Unsaturated	A condition in which the pore spaces in a porous medium are not filled entirely with water, with the remainder of the pore space occupied by air.
UPRR	Union Pacific Railroad
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
Watershed	The geographical region or area drained by a stream. Also: a drainage basin or tributary.
Water Table	The subsurface boundary between an unsaturated zone and a saturated zone; the surface on which the fluid pressure in the pores of a porous medium is exactly atmospheric.
Wetlands	As used herein, areas that under normal circumstances have hydrophytic (water-loving) vegetation, hydric (wet) soils, and wetland hydrology.
WTP	Water treatment plant
WWTP	Wastewater treatment plant

APPENDIX I.2
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APPENDIX I.3
HYDROLOGIC CALCULATIONS

Coyote Valley hydrology has been analyzed using the land use and flood protection plans provided as part of the CVSP Project Synopsis, dated October 25, 2005. (Figure I.3-1) Several conclusions can be reached:

1) Proposed Fisher Creek restoration and Coyote Lake provide sufficient storage to maintain Fisher Creek discharge through the SPRR into Coyote Creek below pre-project flows approved by FEMA.

2) Lake operation is sensitive to its tributary area. It is not feasible to route one percent runoff from substantial areas east of Monterey Highway to the lake if the lake is 50 acres and the winter operating pool cannot vary by more than four feet.

3) With the proposed land use and grading plans, runoff from developed areas adjacent to Coyote Creek east of Monterey Highway cannot be included within the pre-project discharge limit on Fisher Creek. These areas should be evaluated against Coyote Creek discharge rather than Fisher Creek discharge.

4) To properly compare pre-project and post-project discharges at the confluence of Fisher Creek with Coyote Creek, modeled upstream conditions in the Greenbelt and Morgan Hill must match those previously submitted to FEMA. Additional development in the Greenbelt (the FEMA models assumed no real development) and flow from the Morgan Hill Business Park are safely accommodated by the proposed flood protection system, but they should not count against the limit when evaluating the efficacy of mitigation.

METHODOLOGY

The starting point for all hydrologic analysis is the previous Schaaf & Wheeler hydrology study for Coyote Valley Research Park, LLC. The Santa Clara Valley Water District (District) requested that Schaaf & Wheeler revise FEMA's design hydrology for that project. The 72-hour storm pattern was changed to a 24-hour design storm. The 24-hour model was used for the corrected effective FIS hydrology approved by FEMA for CVRP. (The same procedures are used for current project hydrology.)

Starting with the effective HEC-1 models, corrected effective models were built to reflect changes within the watershed since the effective FIS was first published in 1982. From the corrected existing conditions model, Schaaf & Wheeler created a post-CVRP conditions model to evaluate changes in runoff due to the proposed land use plan and flood control infrastructure.

Based on the planned flood control improvements for CVRP, an application for a Conditional Letter of Map Revision (CLOMR) was submitted to FEMA in May 2000 and subsequently approved. The development of the hydrology models submitted to FEMA is discussed in the following sections.

Duplicate Effective HEC-1 Model. Fisher Creek was studied in detail using the District's hydrology procedure in place at the time the effective Flood Insurance Rate Maps (FIRMs) were developed in the late 1970s. However, no effective HEC-1 model was available from FEMA. A 100-year, 24-hour routing model was located; this model used hydrographs from HEC-1 to perform more detailed routing through the floodplain. (Figure I.3-2 describes the model.)

The routing model closely follows the published flowrates in the FIS report. The total flow near Bailey Avenue is 2,100 cfs (FIS = 2,160 cfs). The total flow upstream of the Union Pacific Railroad (UPRR), which was previously the Southern Pacific Railroad (SPRR), is approximately 2,560 cfs based on the flow at Bailey Avenue with area "E" added (FIS = 2,560). The routings, however, produce a final flow of 1,060 cfs at the confluence with Coyote Creek rather than the 700 cfs published in the FIS report.

Corrected Effective HEC-1 Model. After examining the Fisher Creek watershed and discussing the duplicate effective HEC-1 model with the District, the model was considered incorrect, and a corrected effective model was considered necessary to include the following:

- Revised watershed area. The effective FIS hydrology model did not include a portion of the Fisher Creek watershed east of Monterey Road, roughly between Kirby Avenue and Cochrane Road. This was identified a significant error by the District. Subarea "O" drains to storm drains under the UPRR which discharge to Fisher Creek.
- FEMA levee policy. The project area included agricultural levees along Fisher Creek. The levees did not have freeboard and were not owned nor maintained by a public agency. The effective FIS analysis assumed that the levees would be overtopped, but would remain in place. FEMA levee policy at the time of the CVRP project required an alternative levee failure analysis (this remains true today).
- More current topography. The effective FIS was based on aerial photogrammetric cross-sections and did not include detailed topography. Coyote Valley Research Park, LLC obtained detailed topography for the site.
- Detailed overflow analyses. The effective hydrology model did not consider detailed overflows from Fisher Creek into the overbank areas. The model included only generalized storage relationships.

A corrected effective condition HEC-1 model was prepared based on levee-hold and levee-failure conditions. The HEC-1 model included a storage-discharge routing for Fisher Creek near Santa Teresa Boulevard based on the levee failure.

Existing Conditions HEC-1 Models. A road improvement project on Santa Teresa Boulevard was completed after the effective FIS was published. The road project raised the elevation of Santa Teresa Boulevard south of Fisher Creek and transformed it into a six-lane parkway. The project affected the overflow conditions for the levee-holding case, so this model was revised.

The corrected effective model based on levee failure remained accurate for existing conditions.

Post-CVRP Condition HEC-1 Model. Planned improvements assumed build-out within the campus industrial area and existing conditions south of the urban service line (2,400 feet south of Bailey Avenue). The modeled CVRP project involved construction of a bypass channel parallel to Fisher Creek between Bailey Avenue on the south and Santa Teresa Boulevard on the north. The bypass channel included: 1) an overflow weir to release high flows into a storage area north of the bypass and west of Santa Teresa Boulevard, and 2) levee improvements downstream of Santa Teresa Boulevard. Development areas south of Fisher Creek and east of Santa Teresa Boulevard as well as development areas between the bypass channel and Fisher Creek would be filled an elevation above the 100-year design flood elevation. The model includes a diversion to model the overflows into the storage area.

Comparison of Discharges. A comparison of the effective FIS discharges and the corrected effective model output is included in Table I.3-1. In general the corrected effective discharges are more conservative than the FEMA discharges. To match pre-project base flood conditions, no more than 1,550 cfs should be released across the railroad into Coyote Creek.[1]

Table I.3-1

Comparison of Fisher Creek Base Flood Discharges				
	Downstream of Bailey Avenue		***Confluence with Coyote Creek***	
	Drainage Area (sq.mi.)	***Discharge (cfs)***	***Drainage Area (sq.mi.)***	***Discharge (cfs)***
FIS Study	13.0	2,160	15.0	700
FIS Routing	N/A	2,185	N/A	1,062
Corrected Effective (Levee Holding)	13.92	2,630	15.95	1,850
Corrected Effective (Levee Failing)	13.92	2,630	15.95	1,520
Post-CVRP Conditions	13.92	2,975	15.95	1,510

[1] Schaaf & Wheeler, "Fisher Creek Flood Control Project Engineer's Report," 2001.

COYOTE VALLEY SPECIFIC PLAN ANALYSIS

Building on the corrected effective model, proposed land use and grading plans for the Urban Reserve have been evaluated using the same basic hydrologic method. The 24-hour design rainfall pattern and total precipitation depth, as well as the uniform soil loss rates remain the same. Urbanization is modeled by breaking the valley into smaller watersheds (Figure 3 attached) and adjusting unit hydrograph and soil loss parameters:

1. Time of concentration – calculated using the Kirby-Hathaway formula with n=0.02 for pervious surfaces.

2. Storage coefficient, R – calculated assuming a ratio of $R/(t_c + R)$ equal to 0.4 for urban areas and 0.6 for rural areas based on previous studies using the District's methodology.

3. A percent imperviousness is added to the uniform soil loss calculation to address proposed development. Areas of hardscape for each land use typology have been developed from information provided by the Dahlin Group.

To reflect the implementation of C.3 provisions including flow treatment BMPs, the impervious areas are not treated as directly connected. Also any street storage that may be associated with ultimate storm drain design has been neglected. Current plans call for floodplain storage mitigation within a restored Fisher Creek (using choke structures) and Coyote Lake. Approved and permitted plans for Fisher Creek through Coyote Valley Research Park between Bailey Avenue and the railroad are also used in the evaluation.

A number of alternative routings have been tried to evaluate Fisher Creek restoration and Coyote Lake operation. The following general constraints are imposed on this evaluation:

1. Maximum one-percent discharge across SPRR to Coyote Creek is 1520 cfs.
2. Maximum storage level in Laguna Seca is 250 feet ±.
3. Normal Coyote Lake water surface is 246 feet.
4. Maximum winter lake level is 250 feet.

Table I.3-2 provides an evaluation of alternative routing schemes that include:

1. Areas generally west of Santa Teresa Boulevard and south of the Parkway drain directly to Fisher Creek for eventual overflow to Laguna Seca (From Figure 3, Basins SW2, SW3, SW3A, SW4, SW5, NE2, NW1, NW2, XLX, SOB1, SOB2, IBM, and CISCO). The basin east of Monterey Highway south of the Parkway (ME1), and areas east of Santa Teresa and north of the Parkway (Basins NE3, NE4, NE4A, NE5,

NE6, NE7, and LK) all drain to the new Coyote Lake directly or through the urban canal. Areas immediately to the west of Monterey Highway (Basins NE8, NE9, DIV1, DIV2, and DIV3) drain directly to Fisher Creek downstream of the diversion to Laguna Seca. The remaining areas east of Monterey Highway drain through a parkway system to Fisher Creek at the Coyote Creek Confluence, downstream of the railroad.

2. Routing No. 1 but with areas straddling both sides of Monterey Highway (Basins NE8, NE9, ME2) draining to Coyote Lake; and the lake expanded to 60 acres.

3. Routing No. 2 without taking Basin ME2 into the 50-acre lake.

Table I.3-2

Comparison of Routing Plans

Routing Plan	***Discharge Across SPRR (limit 1,550 cfs)***	***Max WSEL in Laguna Seca (limit 250 feet)***	***Max Lake Elevation (limit 250 feet)***
1. ME1, NE3, NE4, NE4A, NE5, NE6, NE7, LK to Lake	1,540	250.0	249.6
2. Also Route NE8, NE9, ME2 to 60 acre Lake	1,830	250.1	250.6
3. No. 2 without ME2 (50 acre Lake)	1,670	250.0	250.2

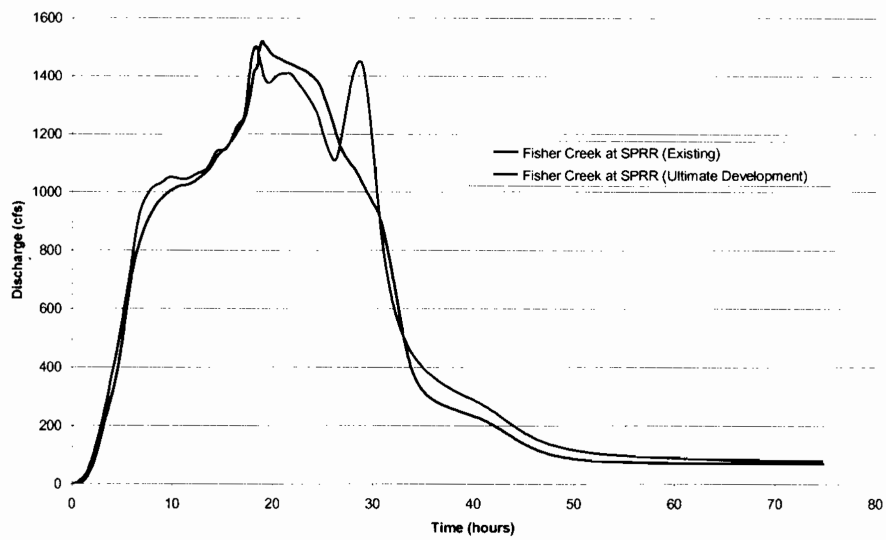
CONCLUSIONS

It is feasible to maintain the FEMA approved pre-project discharges from Fisher Creek to Coyote Creek, although only limited areas adjacent to Coyote Creek should be drained across Monterey Highway. Eventually more detailed unsteady channel flow analyses for the new Fisher Creek floodplain will be required to design and fully assess the performance of choke structures in Fisher Creek and outfall facilities for Coyote Lake.

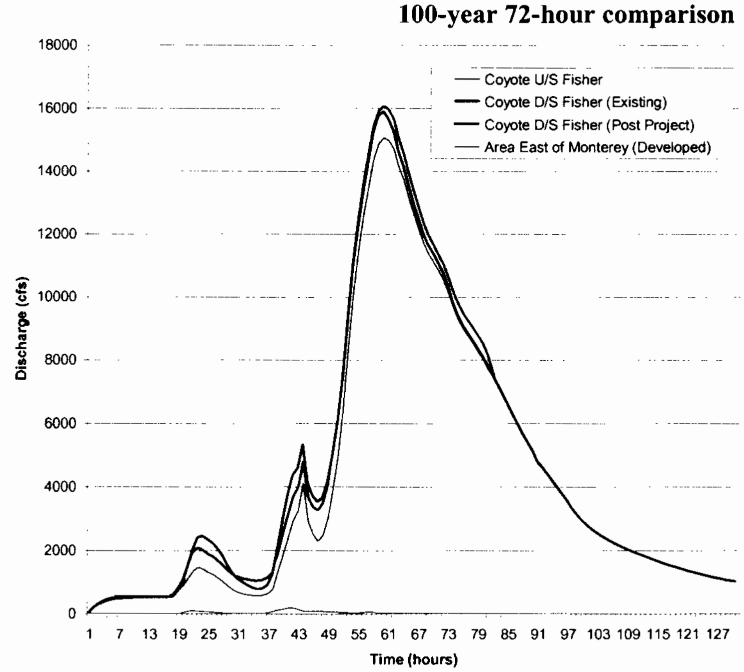
Finding consistent hydrologic models for the Coyote Creek system is somewhat difficult. A model for the one-percent flow of Coyote Creek with initial Anderson Reservoir storage of 81,000 acre-feet shows a discharge of 15,073 cfs upstream of Fisher Creek, closely matching the published discharge of 14,830 cfs. However the peak flow from Fisher Creek in this same model (3,830 cfs) is not close to the published discharge of 700 cfs or the corrected effective discharge of 1,520 cfs. Although it is potentially misleading to compare such mismatched modeling, one-percent hydrographs at the Fisher Creek confluence with Coyote Creek are provided. The hydrographs have been calculated by adding the 72-hour hydrograph for Coyote Creek to newly prepared Fisher Creek models applied with the 72-hour precipitation pattern and rainfall depths from the available HEC-1 model for Coyote Creek.

A comparison of base flood discharges for Fisher Creek at the SPRR crossing just above the confluence with Coyote Creek is also provided, using the corrected effective 24-hour design storm. Hydrographs for existing conditions and the conceptual Fisher Creek restoration with ultimate development are shown together. These hydrographs have been used to prepare an unsteady model of the Coyote Creek and Fisher Creek systems using the previously approved grading plans for Fisher Creek downstream of Bailey Avenue and the Laguna Seca overflow and return system. This modeling shows that even when considering backwater from Coyote Creek, estimated one-percent (100-year) flow is contained within the flood protection system.

100-year 24-hour comparison



100-year 72-hour comparison



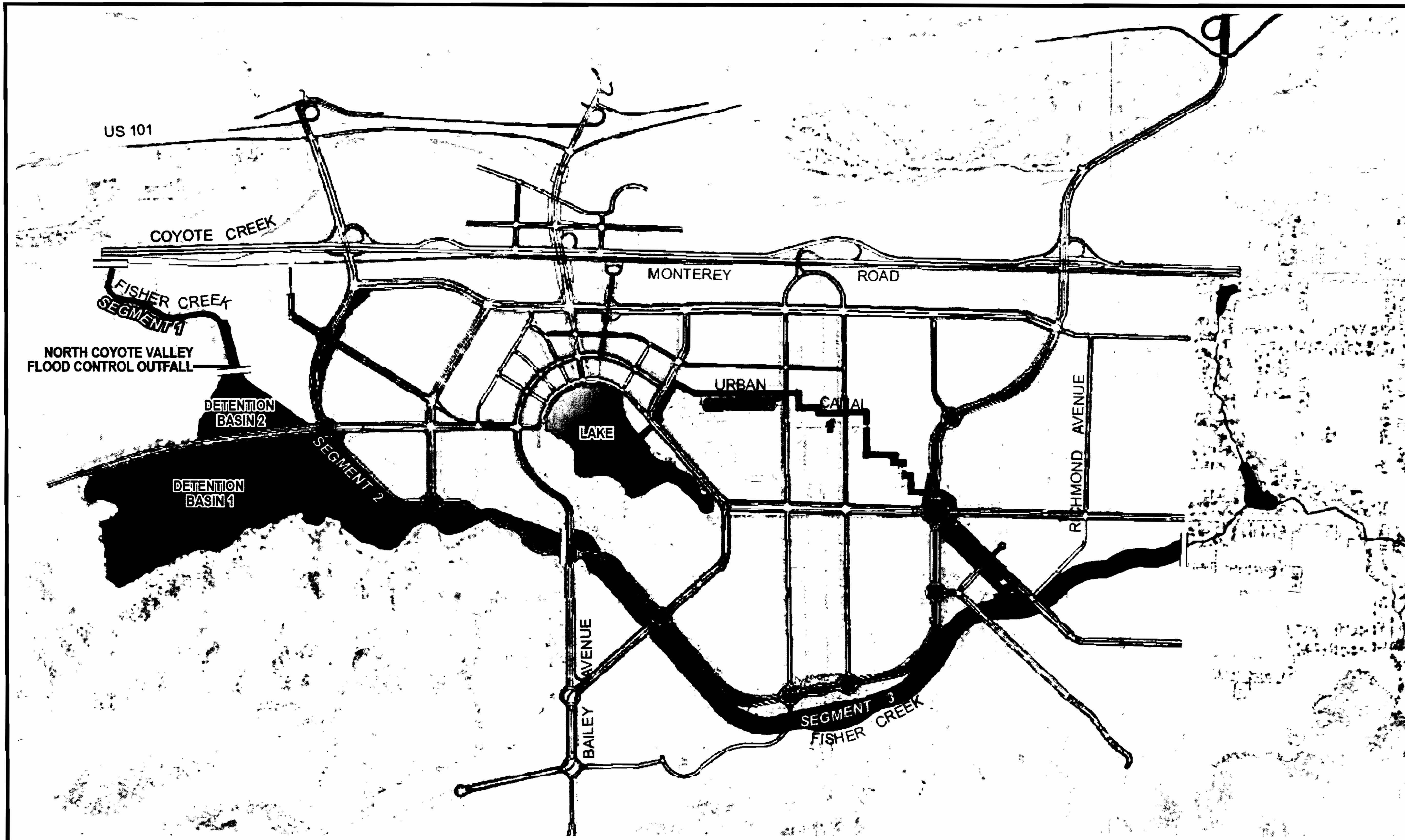


FIGURE I.3-1 **CVSP COMPOSITE CORE DRAINAGE AND FLOOD PROTECTION SYSTEM**

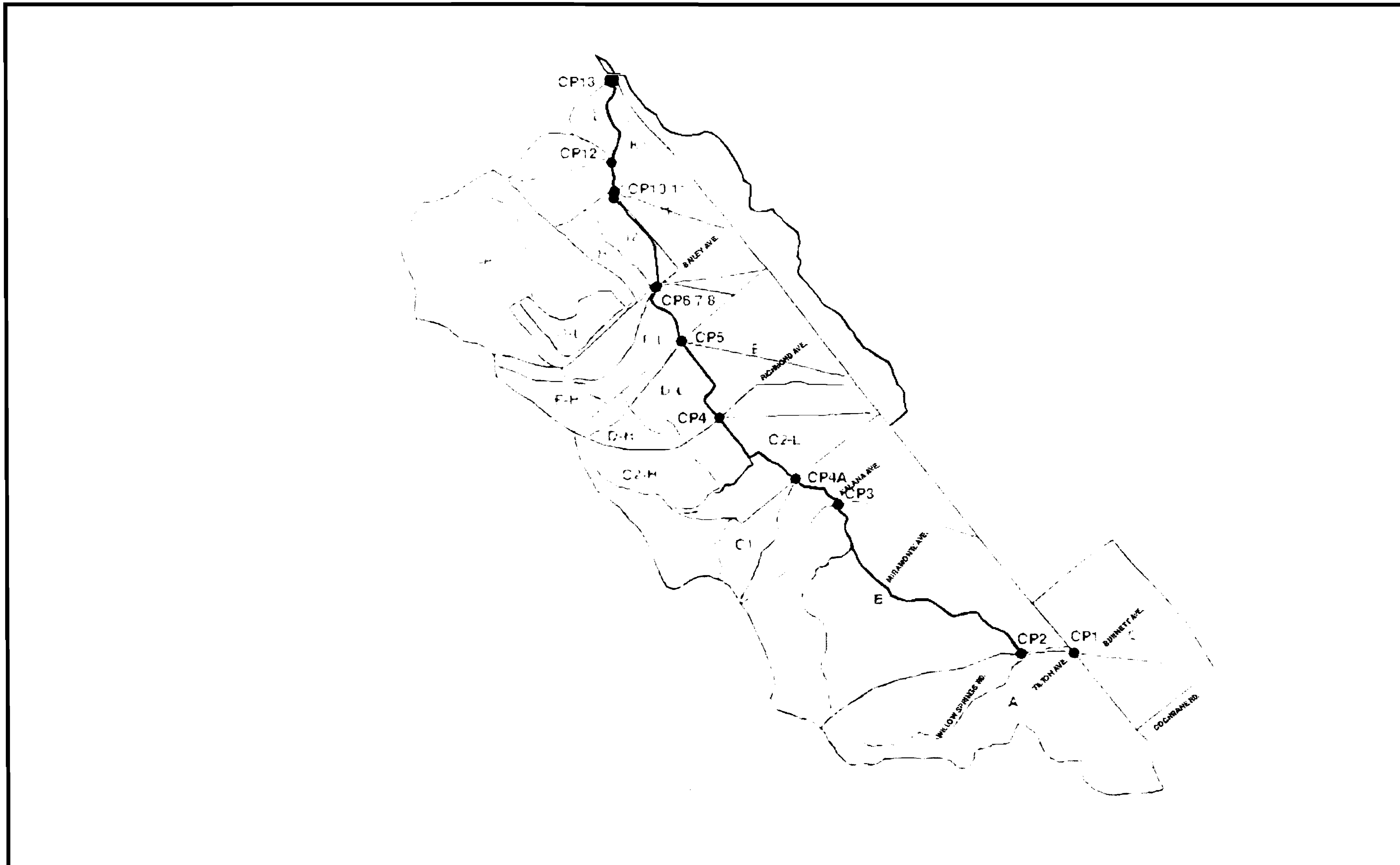


FIGURE I.3-2 KEY FOR DUPLICATE EFFECTIVE HEC-1 MODEL

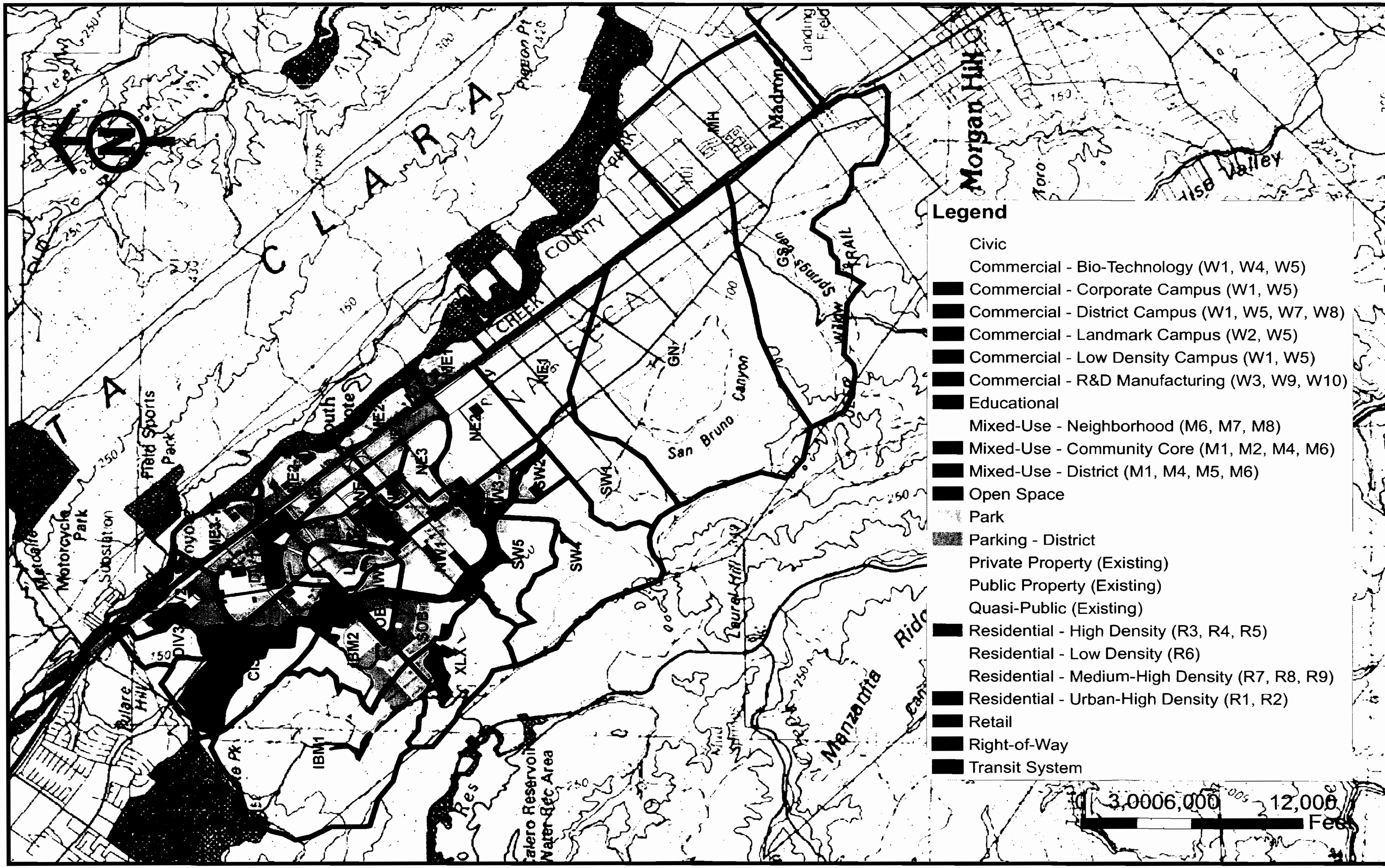


FIGURE I.3-3

KEY FOR POST-CVSP HEC-1 MODEL